HEALTH AND SAFETY PLAN

PRE-DESIGN INVESTIGATIONS ALBION-SHERIDAN TOWNSHIP LANDFILL

Prepared for
The Albion-Sheridan Landfill Group

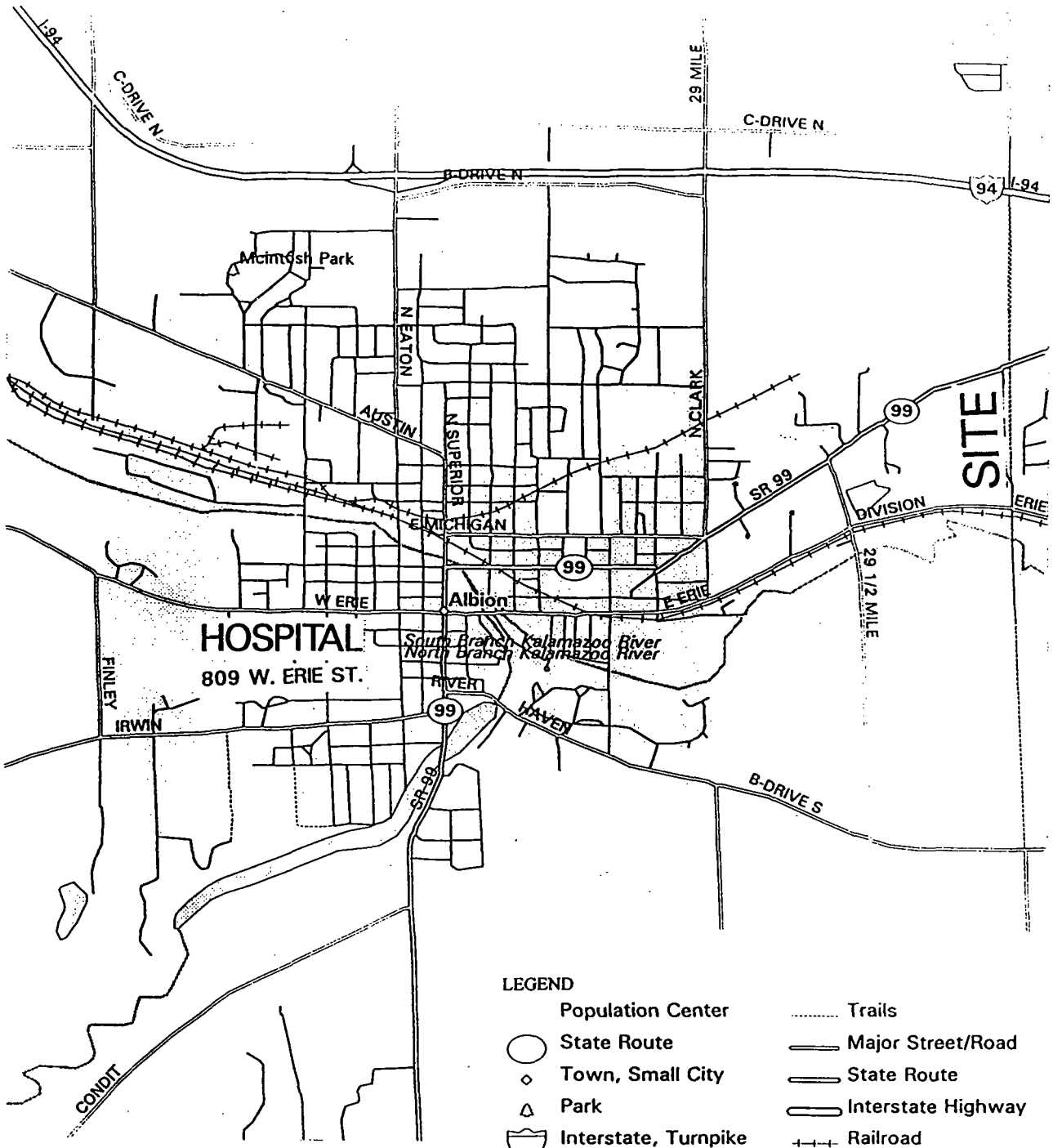
Cooper Industries
Houston, Texas

Corning, Inc.
Corning, New York

Woodward-Clyde

6465 Wayzata Blvd.
Suite 660
Minneapolis Mn 55426

6E13045
July 1996



LEGEND

- Population Center
- State Route
- Town, Small City
- Park
- Interstate, Turnpike
- County Boundary
- Street, Road
- Hwy Ramps
- Trails
- Major Street/Road
- State Route
- Interstate Highway
- Railroad
- River
- Open Water

Scale 1:31,250 (at center)
2000 Feet

1000 Meters

Mag 14.00
Thu May 30 09:48:43 1996

Woodward-Clyde Consultants
ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

HOSPITAL LOCATION MAP
ALBION–SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN

DRN BY: SWH	DATE: MAY 1996	PROJECT NO. 6E07013	FIG. NO. 2
CHK'D BY: DS	DATE: MAY 1996		

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0
PROJECT IDENTIFICATION

Client:	Albion-Sheridan Landfill Group
Site:	Albion-Sheridan Township Landfill
Location:	Albion, Michigan
Project No.:	6E13045
WCC Project Manager:	Robert Gibson, C.P.G.
WCC Field Supervisor:	Dean Stockwell
WCC Field Support:	Robb Johnson
Date of Plan:	June 17, 1996
Expiration Date of Plan:	December 28, 1997

2.0
INTRODUCTION

This Health and Safety Plan (HASP) establishes guidelines and requirements for safety of Woodward Clyde Consultants (WCC) and subcontractor personnel during the performance of pre-design field activities associated with the referenced project. All employees of WCC and its subcontractors, and other contractors who have adopted this HASP involved in field activities on this project are required to abide by the provisions of this HASP. The adoption of this HASP does not relieve Contractors of any obligations to provide a safe working environment in accordance with all applicable federal, state and local requirements including, but not limited to, Occupational Safety and Health Administration (OSHA) Regulations 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response and applicable subparts of 29 CFR 1910 and 1926.

Contractors remain solely responsible for providing their employees with appropriate personal protection equipment. WCC personnel will monitor air quality per this HASP. Contractors are encouraged to independently monitor air quality. In the event that they do not have the appropriate air monitoring equipment or otherwise choose not to monitor air quality, WCC personnel will make a reasonable effort to inform the Contractors' Site Safety Officer(s) of readings measured by WCC. The Contractors are solely responsible for actions taken by their personnel based on the readings.

The health and safety guidelines and requirements presented herein are based on a review of available information and an evaluation of potential hazards. Because of intrusive activities and site conditions which may be encountered, and the uncertainties associated with potential health effects from exposures to various contaminants which may be present, no guarantees can be made regarding the potential for health effects associated with field activities on this site. This HASP outlines the health and safety procedures and equipment required for conducting activities at this site to minimize the potential for exposure to field personnel.

Woodward-Clyde **Memorandum**

To: File
Albion Sheridan Landfill
Project No. 6E07013

From: Todd Fryzek

Office: Minneapolis

Date: December 5, 1997

Subject: Addendum 1 to the Health and Safety Plan

This memo documents modifications to the "Pre-Design Investigations Albion-Sheridan Township Landfill Health and Safety Plan", released in July of 1996.

Changes to this health and safety plan under this addendum include extending the expiration date of the plan from December 28, 1997 to December 31, 1999; and adding drum collection oversight to the health and safety plan.

Woodward-Clyde will be involved in oversight as drums with unknown materials are removed from the landfill. Up to 400 drums are thought to be present in the landfill.

The drums are thought to contain primarily paint and paint wastes. However, the exact contents of the drums is unknown. Testing of some of the drums by the MDNR found the drums to contain both liquid and solid wastes. Levels of contaminants identified in the drums include 2.7 ppm arsenic; 730,000 ppm 1,2,4-trimethyl benzene; 40,000 ppm m/p xylene; 6,500 ppm acetone and 2,400 ppm aluminum.

Direct drum removal, characterization, storage, possibly treatment and disposal will be undertaken by OHM. OHM will be responsible for having a Certified Industrial Hygienist (CIH) on site and will be responsible for air sampling in association with all activities associated with the drums. The Remedial Action Workplan, Volume 2 of 3, WCC, May 1997 presents the minimum H&S requirements for field activities by subcontractors.

The work plan specifies that steel drums located in the TP-9 Area or discovered during other closure activities will be relocated to a drum staging area. The drum staging area is to be situated due south of the TP09-drum area at the southern edge of the waste consolidation area. A staging area will be constructed that is lined with an FML and bermed to contain potential spills and leaks resulting from drum handling.

Woodward-Clyde (WCC) personnel will be only involved in Quality Control (QC) in association with the drum removal. These personnel will stay in the support zone and will not go into the exclusion zone.

The subcontractor will be responsible for undertaking all air sampling. In the event the requirements for air sampling are not being followed or activities outside of the scope of this addendum are undertaken, WCC personnel should contact the WCC Health and Safety

Officer to discuss appropriate actions. However, in the event that conditions are considered to be immediately dangerous to health WCC personnel should temporarily shut down site activities until the problem can be fully accessed and remedied.

The WCC Health and Safety Officer for this project is:

Carla Dodds Ph# (913) 344-1000

Select H&S requirements, PPE levels and air sampling requirements for activities associated with the drum removal, characterization, staging and disposal are summarized below:

PHYSICAL HAZARDS, HEAT STRESS AND COLD EXPOSURE

There is a risk of physical injury when working near heavy equipment. Field personnel shall be aware of these hazards and take steps to avoid contact with them. Physical hazards associated with construction activities are identified and safety procedures shall be followed.

Use of steel-toed steel shank work boots, safety glasses or goggles, and hard hats will be required when in the Exclusion Zone, Contamination Reduction Zone or otherwise working around heavy equipment. Personnel shall be cognizant that when PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition, the PPE required for some activities (coveralls and respirators) places a physical strain on the wearer. A Heat Stress Casualty Prevention Plan will be implemented to deal with this health hazard during warm weather. The Plan will outline heat stress identification, treatment, prevention and monitoring. Fluids will be provided at regular intervals during the work periods in order to maintain adequate body fluid levels for the field personnel.

Severe Weather

Natural disasters may occur at the site due to weather. These include lightning, high winds and winter storm warnings.

- ***Lightning***: Persons should not work in open areas, near trees or other equipment outside during lightning storms. Stop work until the storm passes. If possible, clear the site until the storm passes.

- ***High Winds***: If high winds are forecast, then the site should be cleared before the winds become hazardous. Workers should be instructed to go to an appropriate shelter.

- If an evacuation is called, account for all persons before leaving the site.

- Notify the Project Manager of any work stoppage due to severe weather.

- ***Winter Storm Warnings***: If storm warnings have been posted by local weather forecasters, work should be stopped before conditions become hazardous. Hazardous conditions include blizzard conditions, ice storms and severely low wind chills.

Microorganisms

Microbial action within the landfill is extensive, as demonstrated by elevated temperatures within the waste and the generation of methane. Some of these microorganisms may be capable of causing infection. Personnel sustaining lacerations or punctures from objects in the waste are at particular risk of infection.

Poisonous Plants

Poison ivy, poison oak, and poison sumac may be encountered while completing field activities. All of these plants secrete oils which can cause an itching rash which can spread.

The best defense against poisonous plants is to learn to identify them and ultimately, not come into contact with them. In summer months when leaves are present, if you cannot identify poisonous plants, avoid all three leafed plants. In the fall, spring and winter when leaves are not present, the stems of these plants can still release oils and cause the associated rashes.

If poisonous plants are likely to be, or have been, encountered then Technu pre-exposure or post-exposure lotion should be used. The lotion should be used to treat effected skin or cloths which have been in contact with the plants. Caution must be taken when removing clothing and shoes after going into areas with poisonous plants. Assume these items and your hands have oils from the poisonous plants on them. Wash hands and clothing with Technu lotion.

FLAMMABLE HAZARDS

Flammable hazards are expected to be encountered during the course of this work due to the presence of methane gas. However, hydrogen sulfide, which is also flammable, may also be present. As a precaution, air monitoring, as specified, will be conducted during all intrusive activities.

OSHA INFORMATION POSTER

In accordance with the Occupational Safety and Health Act of 1970, a copy of the OSHA information poster must be present at the Site. It will be posted at full size (11" x 17") in a permanent structure or temporary field office, or be distributed to on-site personnel in this model HASP. The Michigan Health and Safety Poster will also be posted/distributed at the beginning of field activities.

PROHIBITIONS

Smoking, eating, drinking, chewing tobacco or toothpicks, application of cosmetics, storing food or food containers, and having open fires will be permitted only in designated areas to be established by the SSO. Under no circumstance shall smoking, eating, drinking, chewing tobacco or toothpicks, or application of cosmetics be permitted in the Exclusion Zone or the Contamination Reduction Zone. Good personal hygiene shall be practiced by field personnel to avoid ingestion of contaminants.

INITIAL SITE SAFETY MEETING AND SIGNING OF HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

The SSO will hold an initial site safety meeting with the Contractor and relevant subcontractors and other Contractor field personnel before work activities start at the Site. During this meeting, it will be verified that all personnel have been provided with or have reviewed an approved HASP for the work activities to be performed at this Site. For Contractor personnel, subcontractor personnel, and other contractor personnel whose employer(s) have submitted a HASP or adopted this model HASP, the HASP shall be reviewed, discussed and questions answered. Signed Health and Safety Plan Compliance Agreement Forms of personnel who will be following the approved HASP will be collected by the SSO and filed. Individuals refusing to sign the Form will not be allowed to work on the Site.

SITE SAFETY BRIEFINGS

During field operations, site safety briefings will be held at the start of each day by the SSO to review and plan specific health and safety aspects of scheduled work. All field personnel who are following the approved HASP are required to attend these briefings. Potential subjects that may be discussed are presented below:

1. Preliminary
    - Medical clearances
    - Training requirements
    - Written HASP availability
    - Designation of responsibilities for on-site personnel
    - Identification of on-site personnel trained and certified to administer First Aid
2. Training topics
    - Review of HASP including:
        - types of hazards
        - pathways of exposure
        - levels of protection
        - contamination avoidance
        - prohibitions
        - work procedures
        - confined space entry
        - work zones
        - emergency response procedures
        - specific on-site area/work tasks of concern

- Decontamination
- Personnel Protective Equipment
- Air Quality Monitoring Program
- How to Use Fire Extinguishers

3. Questions and Answers

Attachment B contains a form that all personnel will sign, indicating review of this HASP prior to working on-site.

UNDERGROUND STRUCTURES

Caution will be exercised whenever the possibility of encountering subsurface obstructions exists. Before beginning intrusive activities, all available sources of information (such as site utility drawings, public utility drawings, construction drawings, and discussions with former employees) will be reviewed. "Miss Dig", Michigan's Utility Locate Service will be notified at least 72 hours prior to undertaking any subsurface investigation. If underground obstructions are unexpectedly encountered, the area will be excavated using manual equipment until the nature of the obstruction is discerned.

AIR QUALITY MONITORING INSTRUMENTATION

While performing intrusive field activities at the Site, an air quality survey will be performed and the results will be recorded. Several instruments that may be used to monitor air quality are discussed below:

Photoionization Detector

The HNu Systems Model PI-101 Photoionization Detector (HNu PID) or equivalent will be used at the discretion of the SSO to detect trace concentrations of certain organic gases and a few inorganic gases in the air. Methane, ethane, and the major components of air are not detected by the HNu PID. The HNu PID probe selected for this project is the 11.7 eV or equivalent, to quantify the group of contaminants of concern at the Site. The HNu PID detects mixtures of compounds simultaneously. HNu PID readings do not measure concentrations of any individual compound when a mixture of compounds are present.

The HNu PID will be calibrated twice each day (before start of work and at the conclusion of work) using an isobutylene standard for calibration. Calibrations will be documented. HNu PID readings will be measured in the breathing zone of the most highly exposed worker (i.e., closest to the source) at least hourly. This schedule may be reduced following characterization of the air and nature of the work.

Pertinent information concerning the methods and frequency of maintenance and calibration of the HNu PID are included in the manufacturer manual supplied with the instrument. Records of instrument calibrations, settings, and readings will be included in the field data book.

Organic Vapor Analyzer

Monitoring for methane and organic vapors may be conducted using a organic vapor analyzer (OVA). The OVA is a flame ionization detector and will not function without sufficient oxygen. It is vital that frequent response checks be completed. In order to determine the concentration of methane, measure concentrations with a charcoal filter on and again in the same location with the filter off. Measurements must be made in quick succession to be comparable. The measurement with the filter on will indicate how much of a total OVA reading is caused by methane.

The OVA is to be calibrated each day prior to use. Calibrations are to be completed according to manufacturer's specifications using a known quantity (100 ppm) of methane in air. Whenever the OVA is in use it will be periodically response-checked using a felt tip marker to assure the flame is lit. OVA readings will periodically be taken in the breathing zone of personnel on-site. The OVA will be used at the discretion of the SSO.

The presence of methane at the site should be anticipated. Methane which is also known as marsh gas and methyl hydride, is a flammable, colorless, odorless and tasteless gas that is lighter than air and will accumulate in high places. It is a major constituent of natural gas. Methane is generated by the decomposition of organic materials within the landfill and is extremely flammable.

Combustible Gas Indicator/Oxygen Meter

The Neotronics Exotox 40 Combustible Gas Indicator/Oxygen Meter (CGI) or equivalent may be used at the discretion of the SSO to measure the concentration of flammable vapors and gases, oxygen, and hydrogen sulfide (in addition to sulfur dioxide) in the air during field activities. Flammable gas concentrations are measured as percentages of the Lower Explosion Limit (LEL). Oxygen content is measured as a percentage of total air. Hydrogen sulfide concentration (which includes sulfur dioxide) is measured in parts per million.

Pertinent information concerning the methods and frequency of maintenance and calibration of the CGI are included in the manufacturer manual supplied with the instrument. Records of instrument readings shall be documented in the field data book.

Multigas Detector Tubes

Draeger Multigas Detector Tubes or equivalent will be used at the discretion of the SSO to detect and quantify the concentration of selected contaminants in the air. The detector tubes to be employed must be sensitive in the concentration ranges in the OSHA Permissible Exposure Limit (PEL) range for those contaminants. It should be realized that most "compound specific" detector tubes will also detect interference from other aromatic or aliphatic hydrocarbons; readings do not differentiate between which compounds are present. A Draeger pump and detector tubes for benzene, which has a relatively low OSHA PEL, hydrogen sulfide, sulfur dioxide and vinyl chloride may be used during field activities.

The tube readings will be compared to OSHA PELs to determine what level of protection is required. If HNu PID readings are elevated when compared to background (e.g. 4 ppm or more above background) or if phase product or odorous material is detected, then detector tubes for benzene will be employed. Detector tubes for hydrogen sulfide and sulfur dioxide will be employed when the hydrogen sulfide reading on the CGI exceeds 4 ppm.

Pertinent information concerning the Draeger Multigas Detector Tubes which may be used at the site can be obtained from supplier of tubes. Information concerning the use of Detector Tubes, including reasons for use, results of measurements and actions taken will be thoroughly documented in the SSO's daily inspection report.

Personal Monitor for Aerosol and Dust

The MIE, Inc. Model PDM-3 MiniRam Personal Monitor for Aerosol and Dust (MiniRam Monitor) or equivalent will be used at the discretion of the SSO to detect and quantify the concentration of fugitive dust that may be created during ground disrupting operations. The instrument is capable of measuring fugitive dust at concentrations as low as 0.1 mg/m^3.

The MiniRam Monitor will be calibrated twice daily, before start of work and at the conclusion of work. Pertinent information concerning the methods and frequency of maintenance and calibration of the MiniRam Monitor are included with the instrument package. Recording instrument readings will be contained in the field book.

AIR QUALITY RESPONSE LEVELS

A number of response levels will be used during field work if contamination is encountered during air monitoring. The CHSO will be notified as soon as practical of upgrading from the initial levels of protection. The following response are suggested for the work activities covered by this HASP.

During well installation and removal, either an OVA or combustible gas indicator will be used to monitor for methane and other potential flammable gases. Due to no significant levels of VOCs having been found in groundwater samples collected to this time; combined with no elevated levels of VOCs being detected in the breathing zone during monitoring well installation and groundwater sampling (Final Report Pre-Design Studies, Albion-Sheridan Township Landfill, Calhoun County, MI, Woodward-Clyde Consultants, November, 1996); air monitoring will not be required during these activities or other activities where there are no significant intrusive activities.

Air Quality Measurement[1]	Response
HNu PID reading less than 5 ppm above background (1 min average)	Level D Protection or Modified Level D Protection

CGI reading less than 10% LEL Oxygen reading greater than 19.5% and less than 21% Hydrogen sulfide reading less than 5 ppm (CGI and Draeger Detector Tubes) Benzene reading less than 0.5 ppm and vinyl chloride readings less than 0.5 (Draeger Detector Tubes) MiniRam Monitor reading less than 2.5 mg/m^3	(at the discretion of the SSO)
HNu PID reading greater than 5 ppm and less than 10 ppm above background (1 min average) Benzene reading greater than 0.5 ppm and less than 5 ppm (Draeger Detector Tube) MiniRam Monitor reading greater than 2.5 mg/m^3 and less than 10 mg/m^3	Level C Protection
HNu PID reading greater than 10 ppm above background (1 min average) Benzene reading greater the 5 ppm (Draeger Detector Tube) Oxygen reading less than 19.5% or greater than 21% Hydrogen sulfide reading greater than 5 ppm (CGI and/or Draeger Detector Tube) MiniRam Monitor reading greater than 10 mg/m^3 Vinyl chloride readings greater than 0.5 ppm (Draeger Detector Tube)	Level B Protection
Suspend work in immediate area and notify CHSO and Project Manager. Conduct air monitoring periodically to determine when work may be continued. Take mitigative	All ignition sources will be shut off. The work zones will be evacuated immediately. Work will not resume until the CGI readings are continuously

measures as discussed in Section 6.	below 10% LEL for 15 minutes or more.
to suppress emissions as appropriate.	
CGI reading greater than 10% LEL	

(1) All Air Quality Measurements, with the exception of CGI measurements for flammable vapors and gases, shall be made in the breathing zone of personnel who, in the opinion of the SSO, are most exposed to airborne contaminants. Measurements of flammable vapor and gas levels will be made in the vicinity of the nearest ignition source.

Background HNu PID readings will be taken at least twice per day (before start of work and at the conclusion of work). Background levels will be taken at a location which is not affected by on-site work. Once work at the Site begins, relocation of the original background location may be required.

Should work at the Site be conducted using respiratory protection, the need for a personal exposure monitoring program will be evaluated by the CHSO. Details of this program and any monitoring equipment required for its implementation will be specified in an Addendum to this HASP prepared by the CHSO.

Air monitoring will follow the guidelines presented above. In general, air monitoring will initially be undertaken exclusively in the work area and in any immediate area where there is potential risk for chemical exposure or ignition of flammable gas. In the event that chemical levels in work areas require the upgrade of PPE from level "D" to level "C" or level "B", fence line monitoring will be required concurrently with monitoring within the exclusion zone.

Fence line monitoring will consist of the same requirements as those in the work zone. However, there will be no option to upgrade PPE based on elevated air readings at the fence line.

If the fence line PID or OVA reads above 1 ppm, Draegger Tube sampling for benzene and vinyl chloride will commence. If Draegger tube results for either of these two compounds ever exceeds 0.5 ppm, at the fence line, work will cease until levels have dropped below this level for a minimum of one half hour.

Monitoring of the fence line for a flammable atmosphere (LEL, % oxygen, etc.) will not be required as abnormal readings of these parameters in the exclusion zone will require cessation of work.

Background HNu PID readings will be taken at least twice per day (before start of work and at the conclusion of work). Background levels will be taken at a location which is not affected by on-site work. Once work at the Site begins, relocation of the original background location may be required.

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Monitoring of the fence line for a flammable atmosphere (LEL, % oxygen, etc.) will not be required as abnormal readings of these parameters in the exclusion zone will require cessation of work.

Signatures for Addendum 1 of the Albion-Sheridan Township Landfill Health and Safety Plan.

John Seymore — Project Manager — Date: 12/5/97

Carla Dodds - Corporate H&S Officer — Date

1-913-344-1000

Todd Fryzek - Site H&S Officer — Date

TCF:sll

517/629-3966
Best Western / Albion, MI
FAX 517/629-5969
Carla Dodds
1-913-344-1000

Signatures for Addendum 1 of the Albion-Sheridan Township Landfill Health and Safety Plan.

John Seymour - Project Manager — Date 12/5/97

Carla Dods — Corporate H&S Officer — Date 12-8-97

Todd Fryzek — Site H&S Officer — Date 12/5/97

TCF:sll

13.0

HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

I, Clifford S. Yantz (print name), have received a copy of the Health and Safety Plan for the Albion-Sheridan Township Landfill in Albion, Michigan. (Project No.: 6E13045 & 6E07013-18), dated July 1996. I have read the HASP, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the Health and Safety Plan.

Signed:

Clifford Scott Yantz

Signature

12/5/97

Date

Limited Term Employee for W-C

Company

2.1 SITE DESCRIPTION

The following site description is summarized from the ROD (U.S. EPA, 1995) and the SOW (U.S. EPA, 1995). The Albion-Sheridan Township Landfill is an inactive (since 1981), approximately 18-acre municipal and industrial landfill, located at 29975 East Erie Road in Calhoun County, Albion, Michigan (Figure 1).

More specifically, the site is located in Township 2 South, Range 4 West, Section 36 (SE 1/4) approximately one mile east of Albion, Michigan (Figure 1). The site is situated between Michigan Avenue and East Erie Road. A combination of residential, agricultural, commercial and industrial properties surround the site. One residence is located immediately adjacent to the site to the south and five additional residences are located approximately 1000 to 1500 feet southwest of the site along East Erie Road. An active railroad track borders East Erie Road to the south and beyond the railroad tracks lies the North Branch of the Kalamazoo River (approximately 400 feet south of the site). South of the river is agricultural land.

The site is bordered on the east by the Calhoun/Jackson County line and the Amberton Village housing development, with the closest residences approximately 500 feet from the landfill. Several residences and commercial businesses are located along Michigan Avenue approximately 500 feet north of the site. Immediately west of the site is undeveloped land formerly used for agriculture. Orchard Knoll subdivision is located approximately 1500 feet northwest of the site. Approximately 2000 feet northwest of the site is a landfill associated with Brooks Foundry. Approximately one mile west is the city of Albion, Michigan.

2.2 KEY PERSONNEL

2.2.1 Project Manager: Robert Gibson, C.P.G.

The Project Manager has the following responsibilities:

- To see that the project is performed in a manner consistent with the WCC Health and Safety Program.

- To have a HASP prepared and approved.
- To provide the Corporate Health and Safety Officer (CHSO) with project information related to health and safety matters and development of the HASP
- To implement the HASP
- To monitor compliance with the HASP by field personnel

The Project Manager has the authority to take the following actions:

- To determine matters relating to schedule, cost, and personnel assignments on hazardous waste management projects
- To temporarily suspend field activities, if the health and safety of field personnel are endangered, pending further consideration by the CHSO
- To temporarily suspend an individual from field activities for infractions of the HASP, pending further consideration by the CHSO

2.2.2 Corporate Health and Safety Officer: Greg Horton

The CHSO has the following responsibilities:

- To interface with the Project Manager in matters of health and safety
- To develop a HASP for the project and to submit it to the Project Manager
- To monitor compliance with approved HASP
- To assist the Project Manager in seeing that proper health and safety equipment is available for the project

- To approve personnel to work on this site with regard to medical examinations and health and safety training

The CHSO has the authority to take the following actions:

- To suspend work or otherwise limit exposures to personnel if a HASP appears to be unsuitable or inadequate
- To direct personnel to change work practices if they are deemed to be hazardous to health and safety
- To remove field personnel from the project if their actions or condition endangers their health and safety or the health and safety of coworkers

2.2.3 Site Safety Officer: Dean Stockwell

The Site Safety Officer (SSO) and any Alternate Site Safety Officer(s) have the following responsibilities:

- To direct health and safety activities on-site
- To report safety-related incidents or accidents to the Project Manager and CHSO
- To assist the Project Manager in all aspects of implementing the HASP
- To maintain health and safety equipment on-site, as specified in the HASP
- To inspect health and safety activities on-site, as specified in the HASP, and report results to the Project Manager and the CHSO

The SSO has the authority to take the following actions:

- To temporarily suspend field activities, if health and safety of field personnel are endangered, pending further consideration by the CHSO

- To temporarily suspend an individual from field activities for infractions of the HASP, pending further consideration by the CHSO

3.0
SCOPE OF WORK

The pre-design work activities which may be performed under this HASP are limited to the following:

- Performing, as needed, survey(s) of the site to establish property boundaries and current elevations
- Installing and sampling groundwater monitoring wells
- Conducting a native species evaluation
- Conducting a gas emissions study
- Conducting test pit excavations

This HASP does not cover any site activities other than those specifically listed above. Other possible work activities not described above may only be conducted after approval of an appropriate Addendum to this HASP by the CHSO.

This HASP is terminated on December 28, 1997. Use of this HASP after this date to perform the work activities described herein, or other activities in addition to those described herein, is not permitted and constitutes a violation of the Health and Safety Program. If work is to be performed after this date, the HASP must be reviewed and modified, if necessary, by the CHSO.

4.0
HAZARD ASSESSMENT

An assessment of the hazards has been made for each of the activities specified in Section 3.0. Suspected physical, biological, chemical and flammable hazards were evaluated. The following paragraphs summarize the risks that have been identified.

For the activity listed in Section 3.0, the following hazards have been identified:

- Physical hazards associated with the use of heavy equipment (e.g., drilling, excavating, transport, support equipment, etc.)
- Heat stress (depending on season work is to be performed)
- Cold stress (depending on season work is to be performed)
- Biological hazards such as mosquitoes, ticks, snakes, and rabid animals
- Skin and eye contact with contaminants
- Ingestion of contaminants
- Inhalation of organic vapors or contaminated dusts
- Flammable hazards
- Noise exposure
- Tripping hazards
- Use of personal protective equipment

4.1 CHEMICAL HAZARDS

4.1.1 Description of Chemical Hazards

The chemical hazard evaluation is based on the history of the Site and the initial investigations at the Site and is conducted to identify materials that potentially may be present and to ensure that Site activities, personnel protection, and emergency response are consistent with the specific contaminants expected to be encountered. The hazard analysis forms the foundation for this HASP.

The landfill is currently covered with 1 to 4 feet of silty sand with refuse scattered at the surface, including metal, plastic, concrete, asphalt, empty 55-gallon drums, wood, tires, a storage tank, and a junk crane. Test pitting conducted by Michigan Department of Natural Resources (MDNR) uncovered one area of concentrated drum disposal where an estimated 200 to 400 drums are present. Some of the drums contain liquid and solid wastes and suspected paint sludges, including up to 2.7 parts per million (ppm) arsenic, 730,000 ppm 1,2,4-trimethyl benzene, 40,000 ppm m/p xylene, 6,500 ppm acetone and 2,400 ppm aluminum.

The landfill ranges from 16 to 35 feet in thickness and is producing landfill gasses in the form of methane gas and volatile organic compounds (VOCs) in concentrations in excess of 10,000 ppm. The landfill waste contains numerous organic contaminants, including 10 VOCs, 19 semi-volatile compounds (SVOCs), 11 pesticides/PCBs, and inorganic contaminants including antimony, arsenic, chromium, copper, lead, mercury, and zinc.

A leachate plume extends southwest of the landfill for approximately 900 feet and extends vertically to a depth of approximately 45 feet below the water table. The unconsolidated aquifer plume contains 1,2-dibromo-3-chloropropaneand antimony at concentrations above the federal Maximum Contaminant Level (MCL). The bedrock aquifer plume contains vinyl chloride at the MCL and arsenic above the MCL, at concentrations up to 126 ug/l.

As wastes in the landfill have been received from both commercial, industrial and residential sources, the exact nature of chemical hazards on this site are unknown. Sampling results

indicate that there are chemicals within limited areas of the landfill which may present a human health hazard during closure activities. It cannot be assumed, however, that the landfill gas sampling activities have identified all of the chemicals of concern and all of the locations within the landfill with high concentrations of these chemicals.

It is anticipated that the only routes of exposure for on-site workers to waste, soils, water and air would be ingestion, inhalation and skin contact. Ingestion and skin contact of these media should not be a concern as long as personnel adhere to good personal hygiene practices and to the site prohibitions outlined in this HASP.

Physiochemical characteristics of contaminants of concern are presented in Table 4-1. Material Safety Data Sheets (MSDS) for the contaminates of concern and additional potentially hazardous chemicals expected to be present are included in Appendix A.

It is not anticipated that personnel will encounter high concentrations of compounds listed in Table 4-1 at this site. Based on current site knowledge, the risk of concentrations of these compounds exceeding their respective PELs is considered to be low for the activities outlined in Subsection 5.0. Additional hazard information on the contaminants of concern is included in the Material Safety Data Sheets (MSDS) in Appendix A.

A greater hazard on this site is the presence of methane. During intrusive activities on or near areas of solid waste disposal within the landfill site, the presence of methane should be anticipated. Methane, which is also known as marsh gas and methyl hydride, is a flammable, colorless, odorless, and tasteless gas that is lighter than air and will accumulate in high places. It is a major constituent of natural gas. Methane is generated by the decomposition of organic materials within the landfill and is extremely flammable. Air containing between 5 and 15 percent (50,000 to 150,000 ppm) methane and at least 12 percent oxygen can explode. However, as this range is variable, any occurrence of the gas should be considered dangerous. The main hazard involved with methane is its flammability, but it does cause oxygen deficiency at concentrations above 87 percent. Methane is generally considered nontoxic.

Personnel must be cognizant of the potential for fires during construction activities. Concentrations of methane underground may be high. If sufficient oxygen enters the waste, underground fires may start.

Hydrogen sulfide may also be generated during the decomposition of organic materials and may be present within the landfill. It is a colorless, and flammable gas. In low concentrations, it has an offensive odor generally likened to that of rotten eggs. Hydrogen sulfide can be highly toxic. Although the odor of hydrogen sulfide is readily identified at concentrations of less than 1 percent of the PEL, olfactory fatigue is usually experienced within 10 minutes of exposure, rendering odor recognition of this hazard unreliable. At over 200 ppm, olfactory fatigue is experienced almost immediately; at concentrations above 300 ppm severe neurological damage and death can occur. Hydrogen sulfide is explosive at a content of between 4.3 and 46 percent.

Dust may become a hazardous source. If visible that dust is present in the breathing zone, dust control measures will be implemented.

4.1.2 Control of Exposure to Chemical Hazards

Ingestion of constituents of concern will be controlled on this site by prohibiting eating and smoking at the Site (see Section 5.10 and 8.0) and by requiring all field personnel to decontaminate themselves upon leaving the Exclusion Zone. Drinking of liquids will take place only after partial decontamination has taken place (except in a heat stress emergency situation). If necessary, drink breaks will be scheduled at least every two hours to avoid heat stress problems.

Skin and eye contact with some of the constituents at the site may cause skin or mucous membrane irritation or severe burns. Many of those constituents can be absorbed into the bloodstream through the skin or eyes.

Any body area which comes in contact with contaminated materials will be washed with soap and rinsed immediately. All field personnel will report any skin or eye contact symptoms to the SSO. The person will be treated by a physician and steps will be taken to eliminate similar exposures.

Potential hazards will be reduced by protecting against exposures to hazardous materials via utilization of appropriate personal protective equipment (PPE). PPE to protect the body against contact with known or anticipated chemical hazards can be divided into five levels of protection categories (Level A, B, C, Modified D, and D) according to the degree of protection afforded. The initial levels of personal protective equipment to be used while performing the activities at the Site described in Section 3.0 are discussed in Section 7.2, Initial PPE Levels for Specific Work Tasks. Personal Protective Equipment and Levels of Protection are discussed in Section 7.0 of this HASP. Levels A and B are not included in this HASP.

4.2 PHYSICAL HAZARDS, HEAT STRESS AND COLD EXPOSURE

There is a risk of physical injury when working near heavy equipment. Field personnel should be aware of these hazards and take steps to avoid contact with them. Work around heavy equipment can always be dangerous. Due to the limited ability to communicate when wearing respiratory protection, the risk at this site is increased. Workers must be careful to communicate with heavy equipment operators regarding their location and should maintain a safe distance from operating equipment at all times. Physical hazards associated with construction activities are identified and safety procedures should be followed.

Use of steel-toed steel shank work boots, safety glasses or goggles, and hard hats will be required when in the Exclusion Zone, Contamination Reduction Zone or otherwise working around heavy equipment. Personnel should be cognizant that when PPE such as respirators, gloves, and protective clothing are worn, visibility, hearing, and manual dexterity are impaired.

In addition, the PPE required for some activities (coveralls and respirators) places a physical strain on the wearer. A Heat Stress Casualty Prevention Plan (Appendix B) will be implemented to deal with this health hazard during warm weather. The Plan will outline heat stress identification, treatment, prevention and monitoring. Fluids will be provided at regular intervals during the work periods in order to maintain adequate body fluid levels for the field personnel.

Uneven ground will be encountered at the landfill. The risk of injury due to slips, trips, and falls therefore may be significant. Extreme caution is advised.

Excessive noise may be generated from heavy construction equipment. WCC Standard Operating Plan (SOP) 212 (Appendix C) will be adhered to reduce worker exposure to noise.

4.3 BIOLOGICAL HAZARDS

4.3.1 Insects

Numerous types of pest organisms may be present, including bees, mosquitoes, spiders and ticks. Field personnel are encouraged to use insect repellents before donning PPE. Also, field personnel may be required to wear knee high chemically resistant boots while at the Site to protect the feet and lower leg areas. A first aid kit, insect and tick repellent and treatment will be available for use in the field.

Stings of bees and wasps may cause serious allergic reactions in certain individuals. The SSO should identify all personnel with known insect allergies or sensitivities before field work begins.

Spider bites can be extremely serious, e.g., those of the black widow. Others are unpleasant or uncomfortable, resulting in rashes, itching, and possible infection. The possibility of allergies greatly increases the danger since people are not usually aware of such allergies until they have been bitten. Therefore, spiders should be regarded as potentially hazardous. Ticks are parasites that feed on the blood of an animal/human host and can carry several severe diseases, the least bringing several days of fever and pain and the worst causing brain damage. This hazard is discussed in greater detail in Appendix D.

4.3.2 Other Animals

Chipmunks, ground squirrels, rats, and other mammals have been known to harbor fleas carrying bubonic plague. Their bites too can carry rabies and other infections. Chipmunk-like

animals pose a special problem because people tend to try to feed them or pet them, the increased contact bringing greater possibility of danger. Avoid wildlife when possible.

Poisonous snakes may also be encountered on site. Personnel should check for snakes before walking through grassy or debris-strewn areas. A snake bite kit should be included in the first aid kit.

4.3.3 Microorganisms

Microbial action within the landfill is extensive, as demonstrated by elevated temperatures within the waste, and the generation of methane. Some of these microorganisms may be capable of causing infection. Personnel sustaining lacerations or punctures from objects in the waste are at particular risk of infection.

The work zones are believed to present no significant biological hazard.

4.4 FLAMMABLE HAZARDS

Flammable hazards are expected to be encountered during the course of this work due to the presence of methane gas. As a precaution, air monitoring, as specified in Section 6.0, will be conducted during all intrusive activities.

4.5 GENERAL EXPOSURE RISK

4.5.1 Airborne

While many of the chemicals of concern could pose a health threat, the level of worker exposure from airborne contaminants is expected to be low during the site construction activities. Air monitoring will be performed to verify actual exposure levels.

4.5.2 Skin

Skin contact is expected to pose the highest potential level of worker exposure as the field activity includes the handling of contaminated soil and groundwater material. This potential can be minimized by use of proper personal protection equipment (PPE) as discussed in Sections 5.0 and 7.0 through 9.0.

4.5.3 Ingestion

Accidental ingestion can be a significant route of entry for certain materials, including heavy metals such as arsenic. While the risk from contamination is low at this site, good practice includes washing before eating or smoking. Personal habits that allow hand to mouth contact, such as nail biting, should be avoided.

4.5.4 Persistence of Heavy Metals

Certain chemical compounds, particularly the heavy metals are very persistent in the environment. While the contamination level is expected to be well below TLV or PEL, the best approach is to minimize contamination beyond the work zone and avoid the possibility of taking contaminated soil home on boots or clothing. For example, it is recommended that excess dirt on work boots, hard hats, tools, etc., be removed before leaving the site.

5.0
GENERAL HEALTH AND SAFETY REQUIREMENTS

5.1 MEDICAL EXAMINATION

Before commencing any of the activities defined in Section 3.0, all personnel following the approved HASP must take a medical examination as part of a medical surveillance program. This medical surveillance program must meet the requirements of OSHA Regulations 29 CFR 1910.120(f). WCC Medical Surveillance, SOP 501 in Appendix E will be followed to monitor and promote the health of WCC employees.

5.2 TRAINING

All personnel working on-site and potentially exposed to hazardous substances, health hazards or safety hazards shall be thoroughly trained as specified in OSHA Regulations 29 CFR 1910.120(e). This training program will include: (1) attendance at an initial 40-hour basic health and safety training course off the Site; (2) a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor; (3) on-site, site-specific training; and (4) an 8-hour annual update in the basic health and safety training course.

On-site management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations must have received: (1) 40 hours initial training (in accordance with OSHA Regulations 29 CFR 1910.120(e); (2) three days of supervised field experience (3) 8 hours of site supervisor training and (4) additional training at the time of job assignment on such topics as, but not limited to: their company's safety and health program and the associated employee training program; personal protective equipment program; spill containment program; air quality monitoring; emergency response; monitoring equipment usage and calibration; and, health hazardous monitoring procedure and techniques.

Special training will be provided at the time of job assignment to on-site personnel who may be exposed to unique or special hazards not covered by the initial 40-hour basic health and safety

course. Since it is not anticipated that any unique or special hazards will be encountered during this project, special training will not be required for the work activities covered by the approved HASP. If unique or special hazards are unexpectedly encountered, specialized training will be provided.

5.3 INCIDENT REPORTING

Any incident or accident involving personnel working at this Site will require that a Hazardous Waste Incident Report (Appendix F) be filed. Situations covered by this policy include, but are not limited to, fires, explosions, illnesses, injuries, and automobile accidents. These reports must be sent to the CHSO. Worker's Compensation Insurance reports for employees will be filed for each accident or illness which results from work related activities requiring medical attention. The SSO will complete a form for incident reporting in case of an incident.

5.4 ILLUMINATION, SANITATION AND CONFINED SPACE ENTRY

5.4.1 Illumination

All major work tasks are expected to occur during daylight hours. The illumination requirements set forth by OSHA Regulations 29 CFR 1910.120 (m) will be met.

5.4.2 Sanitation

The sanitation requirements regarding potable and non-potable waters, toilet facilities and washing facilities will be followed as set forth in OSHA Regulations 29 CFR 1910.120(n). Food handling and temporary sleeping quarters requirements are not applicable to this site.

5.4.3 Confined Space Entry

Confined space entry will not be required in connection with the field work activities to be performed under this HASP.

5.5 WORK PROCEDURES

- Whenever possible, field personnel should work from a position upwind of work activities

5.6 RESPIRATOR MAINTENANCE, FITTING AND DECONTAMINATION

Respirator use at the Site will follow SOPs 301, 302, and 303 attached in Appendix G and the following procedures.

Respirators, if used, will be cleaned daily according to procedures described herein. Cartridges will be replaced either daily or if breakthrough is detected at any time while in use. The following checks will be performed on a daily basis in addition to the above:

- Exhalation valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve which could cause leakage

- Inhalation valves - screw off both cartridges and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place

- Make sure a protective lens cover is attached to the lens

- Make sure you have the right cartridges

- Make sure that the face piece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment

- Make sure the speaking diaphragm retainer ring is hand tight

To don respirator, fit facepiece on nose bridge making sure that you are able to breathe through nose. Then swing bottom of facepiece into contact with the chin. When using elastic or rubber headbands, position headbands with longest straps above the ears and over the crown of the

head and headbands with shortest straps below the ears around nape of the neck. When using cradle headband, position cradle headband around the crown of the head; position bottom headbands below the ears and around the nape of the neck. Then, adjust the straps for a comfortable fit by moving adjustment slides to lengthen or shorten straps. Adjust the straps just snug enough so that no air leaks around the facepiece. It is not necessary to pull the straps so tight that the respirator digs into the face.

THE RESPIRATOR MUST BE SUBJECTED TO THE FOLLOWING TIGHTNESS TEST BEFORE EACH USE.

Test respirator for leakage using a positive pressure method. Lightly place palm over exhalation valve cover. Exhale gently. A slight positive pressure should build up inside the respirator. If any leakage is detected around the facial seal, readjust head harness straps and repeat test until there is no leakage. If other than facial seal leakage is detected, the condition must be investigated and corrected before another test is made. A negative pressure test should also be performed. Lightly place palms over cartridges or filter holders. Inhale gently and the facepiece should collapse against the face. The respirator must pass the tightness tests before the respirator is used. The respirator will not furnish protection unless all inhaled air is drawn through suitable cartridges or filters.

To decontaminate respirators, the following steps should be undertaken:

- Wash with Alconox soap and water solution and brush gently to remove any soil/solid particulate matter that may have been collected on the respirator during field activities

- Rinse with distilled/deionized water, making sure that the inhalation and exhalation valves are clean and free of obstruction

- Spray with acetone, to remove any traces of organic material collected on the respirator during field activities

- Rinse with distilled/deionized water

- Wipe with sanitizing solution to assure the sterility of the respirator
- Allow respirator to dry
- Place the respirator inside a sealed bag or a clean area away from extreme heat or cold

5.7 PROJECT MANAGER NOTIFICATION

All field personnel must inform the SSO or the Alternate SSO before entering the Site.

IF ANY PREVIOUSLY UNIDENTIFIED POTENTIAL HAZARDS ARE DISCOVERED DURING ANY FIELD WORK, LEAVE THIS AREA OF THE SITE IMMEDIATELY AND CONTACT THE SSO FOR FURTHER INSTRUCTIONS.

5.8 PROJECT SAFETY LOG

A Project Safety Log will be used to record entry and exit dates and times of all field personnel and visitors to the Site; accidents, injuries, and illnesses; incidences of safety infractions by field personnel; air quality and personal exposure monitoring data; and other information related to safety matters. All accidents, illnesses, or other incidents are to be reported promptly to the SSO.

5.9 OSHA INFORMATION POSTER

In accordance with the Occupational Safety and Health Act of 1970, a copy of the OSHA information poster must be present at the Site. It will be posted at full size (11" x 17") in a permanent structure or temporary field office, or be distributed to on-site personnel in this model HASP.

5.10 PROHIBITIONS

Smoking, eating, drinking, chewing tobacco or toothpicks, application of cosmetics, storing food or food containers, and having open fires will be permitted only in designated areas to be established by the SSO. Under no circumstance shall smoking, eating, drinking, chewing tobacco or toothpicks, or application of cosmetics be permitted in the Exclusion Zone or the Contamination Reduction Zone. Good personal hygiene should be practiced by field personnel to avoid ingestion of contaminants.

5.11 INITIAL SITE SAFETY MEETING AND SIGNING OF HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

The SSO will hold an initial site safety meeting with the contractor, subcontractor and other contractor field personnel before work activities start at the Site. During this meeting, it will be verified that all personnel have been provided with or have reviewed an approved HASP for the work activities to be performed at this Site. For contractor personnel, its subcontractors personnel, and other contractor personnel whose employer(s) have submitted a HASP or adopted this model HASP, the HASP shall be reviewed, discussed and questions answered. Signed Health and Safety Plan Compliance Agreement Forms of personnel who will be following the approved HASP will be collected by the SSO and filed. Individuals refusing to sign the Form will not be allowed to work on the Site.

5.12 SITE SAFETY BRIEFINGS

During field operations, site safety briefings will be held at the start of each day by the SSO to review and plan specific health and safety aspects of scheduled work. All field personnel who are following the approved HASP are required to attend these briefings. Potential subjects that may be discussed are presented below:

1. Preliminary

    - Medical clearances

- Training requirements
- Written HASP availability
- Designation of responsibilities for on-site personnel
- Identification of on-site personnel trained and certified to administer First Aid

2. Training topics

- Review of HASP including:
  - types of hazards
  - pathways of exposure
  - levels of protection
  - contamination avoidance
  - prohibitions
  - work procedures
  - confined space entry
  - work zones
  - emergency response procedures
  - specific on-site area/work tasks of concern
- Decontamination.
- Personnel Protective Equipment.
- Air Quality Monitoring Program.

3. Questions and Answers

5.13 UNDERGROUND STRUCTURES

At least 3 days prior to any intrusive activities at the site, "MISS DIG" (1-800-482-7171) will be notified to allow public utilities to identify their underground utilities. Caution will be exercised whenever the possibility of encountering subsurface obstructions exists. Before beginning intrusive activities, all available sources of information (such as site utility drawings, public utility drawings, construction drawings, results of previous magnetometer surveys, and discussions with former employees) will be reviewed. If underground obstructions are unexpectedly encountered, the area will be excavated using manual equipment until the nature of the obstruction is discerned.

6.0 AIR QUALITY MONITORING AND MITIGATIVE MEASURES FOR CONTROL OF EMISSIONS

6.1 AIR QUALITY MONITORING INSTRUMENTATION

While performing intrusive field activities at the Site, an air quality survey will be performed and the results will be recorded. Several instruments that may be used to monitor air quality are discussed below:

- Photoionization Detector

  The HNu Systems Model PI-101 Photoionization Detector (HNu PID) or equivalent will be used at the discretion of the SSO to detect trace concentrations of certain organic gases and a few inorganic gases in the air. Methane, ethane, and the major components of air are not detected by the HNu PID. The HNu PID probe selected for this project is the 10.2 eV or equivalent, to quantify the group of contaminants of concern at the Site. The HNu PID detects mixtures of compounds simultaneously. HNu PID readings do not measure concentrations of any individual compound when a mixture of compounds are present.

  The HNu PID will be calibrated twice each day (before start of work and at the conclusion of work) using an isobutylene standard for calibration. Calibrations will be documented. HNu PID readings will be measured in the breathing zone of the most highly exposed worker (i.e., closest to the source) at least hourly. This schedule may be reduced following characterization of the air and nature of the work.

  Pertinent information concerning the methods and frequency of maintenance and calibration of the HNu PID are included in the manufacturer manual supplied with the instrument. Records of instrument calibrations, settings, and readings should be included in the field data book.

- Organic Vapor Analyzer

Monitoring for methane and organic vapors will be conducted using a organic vapor analyzer (OVA). The OVA is a flame ionization detector and will not function without sufficient oxygen. It is vital that frequent response checks be completed. In order to determine the concentration of methane, measure concentrations with a charcoal filter on and again in the same location with the filter off. Measurements must be made in quick succession to be comparable. The measurement with the filter on will indicate how much of a total OVA reading is caused by methane.

The OVA is to be calibrated each day prior to use. Calibrations are to be completed according to manufacturer's specifications using a know quantity (100 ppm) of methane in air. Whenever the OVA is in use it should be periodically response-checked using a felt tip marker to assure the flame is lit. OVA readings should be taken in the breathing zone of personnel on-site. The OVA will be used at the discretion of the SSO.

The presence of methane at the site should be anticipated. Methane which is also known as marsh gas and methyl hydride, is a flammable, colorless, odorless and tasteless gas that is lighter than air and will accumulate in high places. It is a major constituent of natural gas. Methane is generated by the decomposition of organic materials within the landfill and is extremely flammable.

- Combustible Gas Indicator/Oxygen Meter

The Neotronics Exotox 40 Combustible Gas Indicator/Oxygen Meter (CGI) or equivalent may be used at the discretion of the SSO to measure the concentration of flammable vapors and gases, oxygen, and hydrogen sulfide (in addition to sulfur dioxide) in the air during field activities. Flammable gas concentrations are measured as percentages of the Lower Explosion Limit (LEL). Oxygen content is measured as a percentage of total air. Hydrogen sulfide concentration (which includes sulfur dioxide) is measured in parts per million.

Pertinent information concerning the methods and frequency of maintenance and calibration of the CGI are included in the manufacturer manual supplied with the instrument. Records of instrument readings should be documented in the field data book.

- Multigas Detector Tubes

Draeger Multigas Detector Tubes or equivalent will be used at the discretion of the SSO to detect and quantify the concentration of selected contaminants in the air. The detector tubes to be employed must be sensitive in the concentration ranges in the OSHA Permissible Exposure Limit (PEL) range for those contaminants. It should be realized that most "compound specific" detector tubes will also detect interference from other aromatic or aliphatic hydrocarbons; readings do not differentiate between which compounds are present. A Draeger pump and detector tubes for benzene, which has a relatively low OSHA PEL, hydrogen sulfide, sulfur dioxide and vinyl chloride will be present at the Site at all times.

The tube readings will be compared to OSHA PELs to determine what level of protection is required. If HNu/PID readings are elevated when compared to background (e.g. 5 ppm or more above background) or if phase product or odorous material is detected, then detector tubes for benzene and vinyl chloride will be employed. Detector tubes for hydrogen sulfide and sulfur dioxide will be employed when the hydrogen sulfide reading on the CGI exceeds 4 ppm.

Pertinent information concerning the Draeger Multigas Detector Tubes which may be used at the site can be obtained from supplier of tubes. Information concerning the use of Detector Tubes, including reasons for use, results of measurements and actions taken will be thoroughly documented in the SSO's daily inspection report.

- Personal Monitor for Aerosol and Dust

  Fugitive dust is not expected to be of concern due to the nature of the activities to be performed. Vehicle travel speed will be restricted to speeds that do not create visible dust. The slow nature of the excavation technique will limit the creation of dust from this activity. Formation of visible dust will prompt dust suppression techniques (i.e. watering, slower speeds, etc.).

6.2 AIR QUALITY RESPONSE LEVELS

A number of response levels will be used during field work if contamination is encountered during air monitoring. The CHSO will be notified as soon as practical of upgrading from the initial levels of protection. The following response are suggested for the work activities covered by this HASP.

Air Quality Measurement[1]	Response
HNu PID reading less than 5 ppm above background (1 min average) CGI reading less than 20% LEL Oxygen reading greater than 19.5% and less than 21% Benzene or vinyl chloride reading less than 0.5 ppm (Draeger Detector Tubes) Hydrogen sulfide reading less than 5 ppm (CGI and Draeger Detector Tubes)	Level D Protection or Modified Level D Protection (at the discretion of the SSO)
HNu PID reading greater than 5 ppm and less than 10 ppm above background (1 min average)	Level C Protection

Benzene or vinyl chloride reading less than 1 ppm (Draeger Detector Tube) Vinyl chloride reading less than 0.5 ppm CGI reading greater than 20% LEL HNu PID reading greater than 10 ppm above background (1 min average) Benzene reading greater the 5 ppm (Draeger Detector Tube) Oxygen reading less than 19.5% or greater than 21% Hydrogen sulfide reading greater than 5 ppm (CGI and/or Draeger Detector Tube) Vinyl chloride reading greater than 1 ppm (Draeger Detector Tube)	Suspend work in immediate area and notify CHSO and Project Manager. Conduct air monitoring periodically to determine when work may be continued. Take mitigative measures as discussed in Section 6 to suppress emissions as appropriate. All ignition sources will be shut off. The work zones will be evacuated immediately. Work will not resume until the CGI readings are continuously below 25% LEL for 15 minutes or more.

(1) All Air Quality Measurements, with the exception of CGI measurements for flammable vapors and gases, should be made in the breathing zone of personnel who, in the opinion of the SSO, are most exposed to airborne contaminants. Measurements of flammable vapor and gas levels should be made in the vicinity of the nearest ignition source.

Background HNu PID readings will be taken at least twice per day (before start of work and at the conclusion of work). Background levels will be taken at a location which is not affected by on-site work. Once work at the Site begins, relocation of the original background location may be required.

Should work at the Site be conducted using respiratory protection, the need for a personal exposure monitoring program will be evaluated by the CHSO. Details of this program and any monitoring equipment required for its implementation will be specified in an Addendum to this HASP prepared by the CHSO.

6.3 MITIGATIVE MEASURES FOR CONTROL OF EMISSIONS

Vapor emissions resulting from field operations, if they were to occur, are not anticipated to exceed the action levels. If the action levels are exceeded at any monitoring location, implementation of mitigative measures to suppress emissions should be investigated. Appropriate mitigative measures would include ceasing operations until the exact cause of the emissions could be identified and corrected. Vapor control actions may include vapor suppression foams, covering exposed soil piles with plastic sheeting and/or spraying exposed soil piles with water.

7.0
PERSONAL PROTECTIVE EQUIPMENT

7.1 DESCRIPTION OF LEVELS OF PROTECTION

The personal protection equipment specified in this HASP will be available to all field personnel. The following requirements will be followed in accordance with OSHA Regulations:

- facial hair will not interfere with the proper fit of respirators
- contact lenses will not be worn
- eyeglasses that interfere with the proper fit of full-face respirators will not be worn

Level D Personal Protective Equipment

- Hard hat (when heavy equipment is in use)
- Safety glasses or goggles
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"[1]

(1) Choice at discretion of SSO

Modified Level D Personal Protective Equipment

- Hard hat (when heavy equipment is in use)
- Safety glasses or goggles
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Regular Tyvek® coveralls[1]
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"

- Nitrile-butadiene rubber outer gloves
- Latex surgical gloves (to be work underneath outer gloves)
- Polyethylene coated or Saranex® impregnated Tyvek® coveralls[1] (taped at cuffs)

[1] Choice at discretion of SSO

Level C Personal Protective Equipment

- Hard hat (when heavy equipment is in use)
- Full-face MSA respirator with organic vapor/acid gas/HEPA combination cartridges
- Steel-toed and steel shank work boots (if rubber boots not worn)
- Regular Tyvek® coveralls[1]
- Rubber overboots, steel-toed and steel shank rubber boots, or disposable "booties"
- Nitrile-butadiene rubber outer gloves
- Latex surgical gloves (to be worn underneath outer gloves)
- Polyethylene coated or Saranex® impregnated Tyvek® coveralls[1] (taped at cuffs)

[1] Choice at discretion of SSO

Air monitoring equipment described previously will be provided. A first aid kit, and eye wash station will be present and maintained at the Site.

Selection of the PPE specified for this project is based on a review of the identified or suspected hazards, routes of potential exposure to on-site workers (inhalation, skin absorption, ingestion, and skin or eye contact) and the performance of the personal protective equipment in providing a barrier to these hazards. In addition, the choice of PPE has been reviewed to match the work requirements and task-specific conditions to provide adequate protection without causing unnecessary physical impairment to the worker.

7.2 INITIAL PPE LEVELS FOR SPECIFIC WORK TASKS

Level D PPE has been established for initial monitoring well installation, groundwater sampling, and surveying activities described in Section 3.0. Level C PPE has been established

for the excavations to further characterize the extent of waste. It is the responsibility of the SSO to determine if a PPE upgrade is warranted based on air monitoring results.

8.0
DESIGNATION OF WORK ZONES

To minimize the movement of contaminants from the Site to uncontaminated areas, three work zones will be set up around each individual area of intrusive activity. The three work zones will consist of the following:

Zone 1:	Exclusion Zone
Zone 2:	Contamination Reduction Zone
Zone 3:	Support Zone

The Exclusion Zone is the area where contamination occurs or could occur. Initially, the Exclusion Zone should extend a distance of 25 ft from the edge of intrusive activity unless conditions at the Site warrant either a larger or smaller distance as determined by the SSO. All persons entering the Exclusion Zone must wear the applicable level of protection as set forth in Section 7.1, Personal Protective Equipment and Section 7.2, Initial PPE Levels for Specific Work Tasks. It is anticipated that work zones will be established at each individual area of intrusive work rather than encompass the entire Site.

The Support Zone is the area of the Site where exposure to contamination is not expected to occur during non-intrusive activities. The Support Zone is considered to be the "clean area" of the Site.

Between the Exclusion Zone and Support Zone is the Contamination Reduction Zone which provides a transition zone between the contaminated and clean areas of the Site. The Contamination Reduction Zone will be located directly outside of the Exclusion Zone. All personnel must decontaminate all gross potentially contaminated material (i.e. dirt on boots, gloves, etc.) when leaving the Exclusion Zone. A centrally located Contamination Reduction Zone (decontamination area) will be established to service each of the individual areas of intrusive work. Prior to exiting the Site, all personnel who have entered the Exclusion Zone will completely decontaminate (including equipment exiting the site) according to Section 9.

9.0
DECONTAMINATION PROCEDURES

The following steps will be taken for decontamination of personnel:

- Deposit equipment that needs to be decontaminated on plastic drop cloths
- Wash boots and outer gloves with long handled brushes in wash tub containing Alconox and water
- Rinse boots and outer gloves with long handled brushes in a wash tub containing clear water or use a sprayer to rinse off boots and gloves
- Remove tape and place in disposal drum
- Remove outer gloves and place in disposal drum
- Remove suit and place in disposal drum
- Remove respirator and place on table to be decontaminated
- Remove inner gloves and place in disposal drum
- Wash hands and face

All tools or equipment which have been in contact with contaminated materials must be decontaminated after leaving the Exclusion Zone. This decontamination is to be performed using a high pressure/hot water "steam type" cleaner or a spray/rinse decontamination sequence as described in Section 5.6, Respirator Maintenance, Fitting and Decontamination, as appropriate.

10.0
EMERGENCY RESPONSE PLAN

The purpose of this section of the HASP is to address how personnel at the Site will respond to emergencies. WCC SOP 503 (Appendix H) is incorporated by reference. The types of potential emergencies that are addressed by this Plan include:

- Fires
- Chemical exposures
- Physical injuries

Decontamination procedures as specified in Section 9.0 will be followed to prevent the spread of contamination off-site.

10.1 EMERGENCY RECOGNITION AND PREVENTION

10.1.1 Fires

Fires are possible whenever flammable gases or vapors are present in proper concentrations and an ignition source is present. The construction equipment itself provides an ignition source. To prevent fires, a CGI as specified in Section 6.0 will be used to detect flammable concentrations of gases or vapors. Ignition sources will be turned off and the area evacuated if vapors or gases reach 20% of the Lower Explosion Limit (LEL) as measured by the CGI. Work will not resume until the SSO observes CGI readings below 20% of the LEL for a minimum of 15 consecutive minutes.

10.1.2 Chemical Exposures

Work should always be performed in a manner that minimizes exposure to contaminants through skin or eye contact, inhalation or ingestion. Work practices that shall be followed to reduce the risk of chemical exposure include:

- PPE, as specified in Section 7.0, for the appropriate work activities and areas as defined by the SSO, will be used by all field personnel following this HASP. A formal revision to the HASP must be made by the CHSO to modify the PPE specifications
- Keep hands away from face during work activities
- Minimize all skin and eye contact with contaminants

Early recognition of the symptoms of chemical exposure is essential for the prevention of serious chemical exposure incidents. Symptoms of exposure to the types of compounds potentially present at the Site include the following: fatigue, weakness; eye, nose, and/or throat irritation; headache; dizziness; nausea; vomiting; malaise; tremors; aggressive confusion; cyanosis (blue color to skin); anemia; and muscle spasms. If a person experiences any of these symptoms, or others, or recognizes any of the symptoms in a fellow worker, the person experiencing the symptoms shall immediately stop work and report his or her symptoms to the SSO. If the symptoms persist or appear to be damaging in any way, the SSO will make arrangements to take the individual to a hospital for medical treatment. If the symptoms are serious, work activities in the area where the person was exposed will be discontinued until more is known about the incident. Incident reporting procedures as specified in Section 5.3 will be initiated.

10.1.3 Physical Injuries

Site personnel should constantly look for potential safety hazards such as holes or ditches; improperly positioned objects, such as drums or equipment that may fall; sharp objects, such as nails, metal shards, and broken glass; protruding objects at eye or head level; slippery surfaces;

steep grades; uneven terrain or unstable surfaces, such as walls that may cave in or flooring that may give way. Site personnel should inform the SSO of any potential hazards observed so that corrective action can be taken.

10.2 EMERGENCY ALERTING PROCEDURES

The SSO will alert the appropriate work groups when an emergency occurs through the use of radios or by directly contacting the work group. The SSO and any isolated work group will carry radios if direct contact cannot be maintained. A single blast from an air horn will be used to signal workers to stop work and assemble in the Contamination Reduction Zone. If evacuation of the Site is necessary, three blasts from an air horn will be used to signal workers.

10.3 EVACUATION PROCEDURES AND ROUTES

Normally, personnel should evacuate through the Contamination Reduction Zone, and from there, to the Support Zone. If a fire blocks entry into the Contamination Reduction Zone, personnel will proceed directly to the Support Zone. Evacuation from the Contamination Reduction Zone will proceed in an upwind direction from the emergency. If evacuation to the Support Zone does not provide sufficient protection from the emergency, personnel will be advised to evacuate the Site proper.

10.4 TELEPHONE NUMBERS OF EMERGENCY SERVICES

The telephone numbers of local emergency services are given below.

Emergency Service	Telephone Number
Ambulance (EMS)	(517) 629-9431
Fire Department	(517) 629-3933
Police Department	(517) 629-3933
Albion Community Hospital	(517) 629-2191
Poison Control Center	(800) 442-4571
U.S. EPA National Response Center	(800) 438-2427

These telephone numbers must be verified by the SSO prior to the start of fieldwork. The ambulance, fire and police departments are all available by dialing **911**.

10.5 EMERGENCY RESPONSE PERSONNEL

The SSO will have the primary role in responding to all emergencies at the Site. The SSO, or the Alternate SSO, will be present at the Site during all work activities. If any emergency such as a fire, chemical exposure, or physical injury occurs, the SSO shall be notified immediately. All site personnel will take direction from the SSO in cases of emergency response.

After an emergency has occurred at the Site, the causes and responses to that emergency should be thoroughly investigated and documented by the Project Manager and SSO; this documentation will be submitted to the Corporate Health and Safety Administrator and CHSO.

10.6 DECONTAMINATION PROCEDURES DURING AN EMERGENCY

Decontamination of an injured or exposed worker or during a site emergency shall be performed only if decontamination does not interfere with essential treatment or evacuation.

If a worker has been injured or exposed and decontamination can be done: wash, rinse, and/or cut off protective clothing and equipment.

If a worker has been injured or exposed and decontamination cannot be done:

- Wrap the victim in blankets, plastic or rubber to reduce contamination of other personnel
- Alert emergency and off-site medical personnel to potential contamination
- Have the SSO or other personnel familiar with the incident and contaminants at the Site accompany the victim to the hospital

10.7 EMERGENCY MEDICAL TREATMENT AND FIRST AID RECOMMENDED PROCEDURES

Emergency medical treatment or First Aid may be administered at the Site by the SSO or other personnel who have been certified in First Aid. WCC SOP 211 (Appendix I) will be enacted if exposure to bodily fluids is encountered.

General emergency medical and First Aid procedures are as follows:

- Remove the injured or exposed person(s) from immediate danger
- Render First Aid, if necessary. Decontaminate affected personnel, if necessary. Dean Stockwell (SSO) is first aid/CPR trained
- Call an ambulance for transport to local hospital immediately, this procedure should be followed even if there is no apparent serious injury
- Evacuate other personnel at the Site to safe places until the SSO determines that it is safe for work to resume
- Report the accident to the CHSO immediately

10.8 DIRECTIONS TO THE ALBION COMMUNITY HOSPITAL FROM SITE

- Go west on East Erie Road which will turn into West Erie Street at Superior
- After one stop sign and two traffic lights (from the site), you will see Albion Community Hospital on the left side of West Erie Street (8 blocks past second stoplight)
- Albion Community Hospital is located at 809 West Erie Street, Albion, MI 49224

Directions to the Albion Community Hospital from the Site must be verified by the SSO prior to the start of field work. A map illustrating directions to the Albion Community Hospital is included in Figure 2.

11.0
PERSONNEL ASSIGNMENTS

11.1 PROJECT PERSONNEL

Personnel authorized to enter the Site and work on this project subject to compliance with provisions of the HASP, are:

Project Manager	Robert Gibson, C.P.G.
Site Safety Officer	Dean Stockwell
Corporate Health and Safety Officer	Greg Horton

Other personnel who meet the HASP requirements, including training and participation in a medical surveillance program, may enter and work on the Site subject to compliance with provisions of the HASP.

11.2 PROJECT SAFETY RESPONSIBILITIES

Personnel responsible for implementing a Health and Safety Plan are the Project Manager and the Site Safety Officer.

12.0
HEALTH AND SAFETY PLAN APPROVALS

Stacey Lill for Bob Gibson 8-1-96

Project Manager Date

Corporate Health and Safety Officer Date

HEALTH AND SAFETY PLAN APPROVALS

Project Manager	Date
Corporate Health and Safety Officer	7-30-96 Date

13.0
HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

I,_____(print name), have received a copy of the Health and Safety Plan for the Albion-Sheridan Township Landfill in Albion, Michigan. (Project No.:), dated _____. I have read the HASP, understand it, and agree to comply with all of its provisions. I understand that I could be prohibited from working on the project for violating any of the safety requirements specified in the Health and Safety Plan.

Signed:

_____ _____

Signature Date

_____

Company

Tables

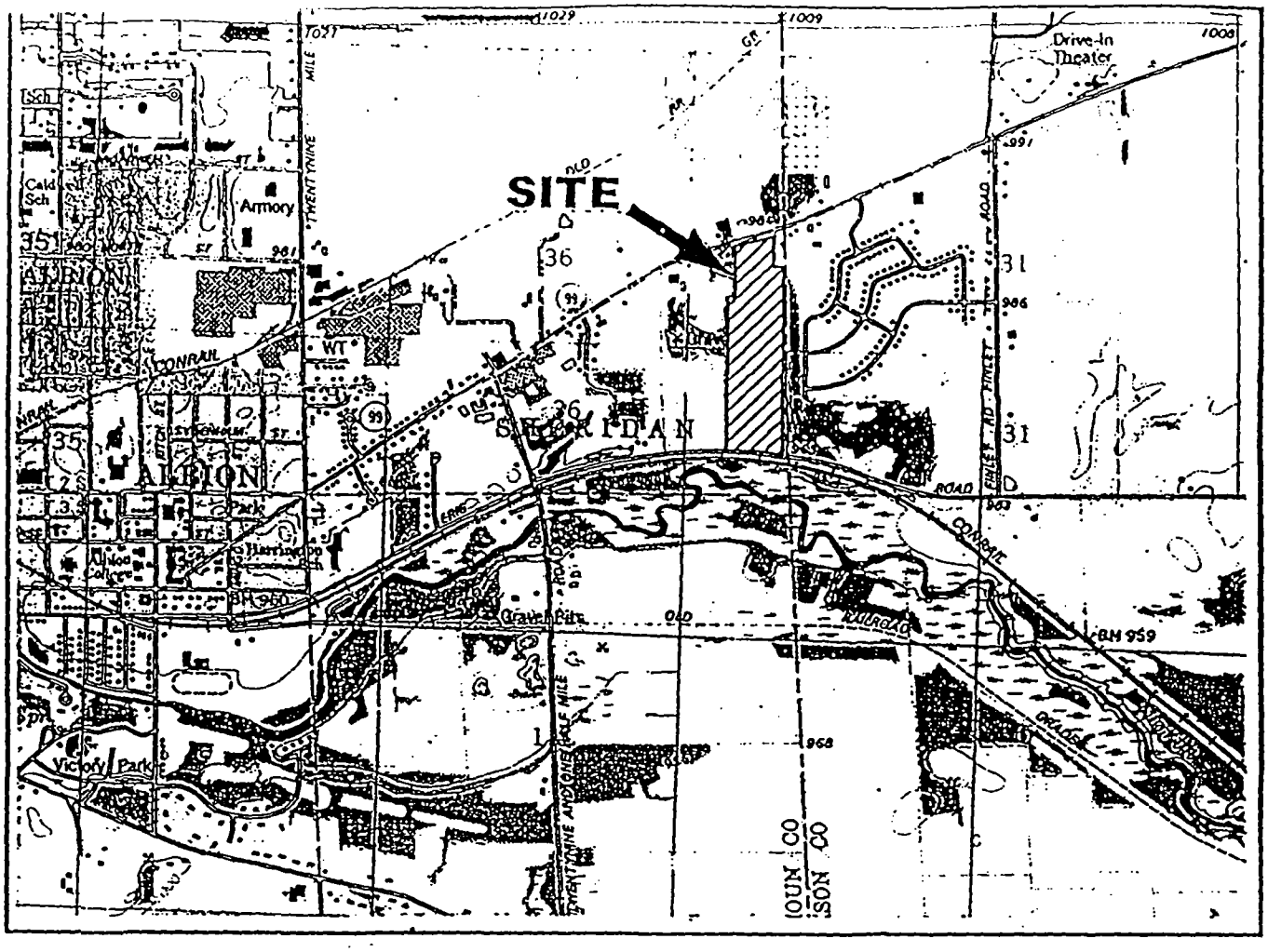
TABLE 4-1
Physicochemical Characteristics of Chemicals of Concern
Albion-Sheridan Township Landfill

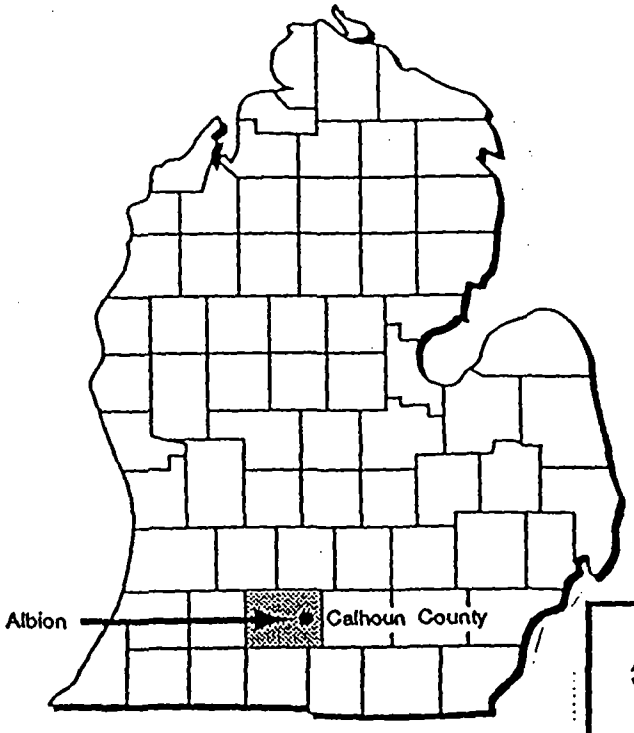
	CAS #	OSHA PEL	ACGIH TLV/ Recommended Exposure Limits	IDLH	Target Organs	Route of Exposure	Symptoms of Exposure	Vapor Pressure	Specific Gravity	Lower Explosive Limit	Upper Explosive Limit	Skin Hazard	Odor Threshold	Carcinogen Category	HNu % Response (Benzene)		OVA % (Methane) Response	Photon Correction Factor (Isobutylene)		MicroRAE Correction Factor (Isobutylene)	Ionization Potential	MW
								mm @ 68 F	Referenced to water or air	%	%				10.2 eV	11.7eV		10.6 eV	11.7 eV	10.6 eV	eV	grams
Acetone	67-64-1	1000 ppm (750 ppm) (1000 ppm S)	750 ppm 1000 ppm S	2500 ppm	Eyes, skin, respiratory, central nervous	Inhalation, contact, ingestion	Dermatitis, irritation of nose and throat, headache, dizziness, mental confusion, central nervous system depression	180	0.79 (water)	2.5	12.8	NO	mint like 3 - 653 mg/m³	IRIS D	6.3	5.7	60	1.2	NE	1.31	9.69	58.1
Aluminum (metal dust)	7429-90-5	15 mg/m³ (T) 5 mg/m³ (R)	10 mg/m³ (T) 5 mg/m³ (R)	NE	Skin, respiratory, eyes	Inhalation, contact	Irritation of eyes, skin and respiratory system	0	2.7 (water)	NA	NA	NO	odorless	NE	NA	NA	NA	NA	NA	NA		26.98
Ammonia	7664-41-7	50 ppm S (35 ppm S)	25 ppm 35 ppm S	300 ppm	Eyes, skin, respiratory	Inhalation, ingestion, contact	Irritation of eyes, nose throat, chest pain; pulmonary edema; skin burns; pink frothy sputum; breathing difficulties	6430	0.6 (air)	15	28	NO	sharp, cloying repellent 0.43 - 53 ppm	NE	0.3	NE	NE	NE	NE	NE	10.18	17
Antimony	7440-36-0	0.5 mg/m³	0.5 mg/m³	50 mg/m³	Eyes, skin, respiratory, cardiovascular	Inhalation, ingestion, contact	Irritation of eyes, skin, nose, throat, mouth; cough; dizziness; stomach cramps; unable to smell properly; vomiting; diarrhea; headache; anorexia	0	6.69 (water)	NA	NA	NO		NE	NA	NA	NA	NA	NA	NA		121.75
Arsenic (inorganic)(Metal)	7440-38-2	0.01 mg/m³	0.01 mg/m³	5 mg/m³	Liver, kidneys, skin, lungs, lymphatic	Inhalation, absorption, contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, cancer, hyperpigmentation of the skin	0	5.73 (water)	NA	NA	NO	odorless	IRIS A1	NA	NA	NA	NA	NA	NA		74.9
Benzene	71-43-2	1 ppm 5 ppm S	0.3 ppm (a) 10 ppm	500 ppm	Eyes, skin, respiratory, blood, central nervous, bone marrow	Inhalation, absorption, ingestion, contact	Irritation of skin, nose, respiratory system; giddiness; headache; nausea; lassitude; bone marrow depression, fatigue; anorexia; dermatitis; leukemia	75	0.88 (water)	1.2	7.8	NO	aromatic 5 - 119 ppm	*IRIS* A	10	12.2	150	0.5	NE	0.56	9.24	78.1
Chromium (metal)	7440-47-3	1 mg/m³	0.5 mg/m³	250 mg/m³	Eyes, skin, respiratory	Inhalation, ingestion, contact	Irritation of eyes, skin; lung fibrosis	0	7.14 (water)	NA	NA	NO	odorless	NE	NA	NA	NA	NA	NA	NA		52
Copper (dust)	7440-50-8	1 mg/m³	.1 mg/m³	100 mg/m³	Eyes, skin, respiratory , liver, kidneys	Inhalation, ingestion, contact	Irritation of eyes, nose, pharynx; nasal perforation; metallic taste; dermatitis; in animals: lung, liver, kidney damage; anemia	0	8.94 (in water)	NA	NA	NO	odorless	IRIS D	NA	NA	NA	NA	NA	NA		
Ethyl Benzene	100-41-4	100 ppm (125 ppm S)	100 ppm 125 ppm S	800 ppm	Eyes, skin, respiratory, central nervous	Inhalation, ingestion, contact	Irritation of eyes, skin, and mucous membrane; headache; dermatitis; narcosis; coma	7	0.87 (water)	0.8	6.7	NO	aromatic	IRIS D	NE	NE	100	0.6	NE	NE	8.76	106.2
Hydrogen Sulfide	7783-06-4	20 ppm C (10 ppm) (15 ppm S)	10 ppm 15 ppm S	100 ppm	Eyes, respiratory, central nervous	Inhalation, contact	Cessation of breathing; irritation of eyes, respiratory system; coma; convulsions; eye pain; tearing; visual intolerance to light; dizziness; headache; fatigue; irritability	17.6	1.19 (air)	4	44	NO	0.001-0.13 ppm quickly fatigues olfactory	NE	NE	NE	NE	NE	NE	NE	10.46	34.1
Lead (inorganic)	7439-92-1	0.05 mg/m³	0.05 mg/m³	100 mg/m³	Eyes, gastrointestinal tract, central nervous, kidneys, blood, gum tissue	Inhalation, ingestion, contact	Weakness, lassitude, insomnia; weight loss; constipation; abdominal pain; anemia; gum lead line; tremor; paralysis of wrist, ankles; encephalopathy; kidney disease; eye irritation; hypotension	0	11.34 (water)			NO	odorless	IRIS B2	NA	NA	NA	NA	NA	NA	NA		207
Mercury (organo) alkyl compounds (as Hg)	7439-97-6	0.01 mg/m³ 0.04 mg/m³ C (0.03 mg/m³ S)	0.01 mg/m³ 0.03 mg/m³ S	2 mg/m³	Eyes, skin, central nervous, peripheral nervous, kidneys	Inhalation, ingestion, absorption, contact	Numbness or tingling sensation, incoordination, vision and hearing disturbance; jarring limbs; dizziness; salivation nausea; vomiting; diarrhea; constipation; skin burns; emotional disturbance; possible terstogenic effects	varies	varies			YES		IRIS D	NA	NA	NA	NA	NA	NA			
Nickel (soluble salts)	7440-02-0	1 mg/m³ (0.1 mg/m³)	0.1 mg/m³ 0.05 mg/m³ (a)	10 mg/m³	Nasal cavities, lungs, skin	Inhalation, ingestion, contact	Sensitization dermatitis, allergic asthma, pneumonitis, cancer	0	8.9 (water)			NO	odorless	IRIS A1 (refinery dust)	NA	NA	NA	NA	NA	NA		58.69
Toluene	108-88-3	200 ppm 300 ppm C (100 ppm) (150 ppm S)	50 ppm	500 ppm	Eyes, skin, respiratory, central nervous, liver, kidneys	Inhalation, absorption, ingestion, contact	Irritation of eyes, nose; fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils; tearing; nervousness; muscle fatigue; dermatitis, liver and kidney damage	21	0.87 (water)	1.1	7.1	NO	sweet pungent 2.14 ppm	IRIS D	10	10	110	0.5	NE	NE	8.82	92
Trimethylbenzene 1,2,4-	95-63-6	(25 ppm)	25 ppm		Eyes, skin, respiratory, central nervous, blood	Inhalation, ingestion, contact	Irritation of skin, nose, throat, respiratory system; bronchitis; headache; drowsiness; fatigue; dizziness; nausea; incoordination; vomiting; confusion; chemical pneumonia	1	0.88 (water)	0.9	6.4	NO	distinctive aromatic odor	NE	NE	NE	NE	NE	NE	NE	8.27	120.2
Vinyl Chloride (Chloroethylene)	75-01-4	1 ppm 5 ppm C	5 ppm	NE	Liver, central nervous, blood, respiratory, lymphatic	Inhalation, contact	Weakness, abdominal pain, gastrointestinal bleeding, enlarged liver, cyanosis of extremities	2508	2.21 (air)	3.6	33	NO	sweet, high threshold	IARC 1	5	NE	35	1.8	NE	2.14	9.99	62.5
Xylene, all isomers	1330-20-7	100 ppm (150 ppm S)	100 ppm 150 ppm S	900 ppm	Eyes, skin, respiratory, central nervous, gastrointestinal tract, blood, liver, kidneys	Inhalation, absorption, ingestion, contact	Irritation of eyes, skin, nose, throat; dizziness; excitement; drowsiness; incoordination, anorexia; nausea; vomiting; abdominal pain; dermatitis	7	0.86 (water)	1.1	7	NO	aromatic	IRIS D	11.2	NE	111	0.5	NE	0.4	8.56	106.2
Zinc Oxide Dust	1314-13-2	10 mg/m³ T 5 mg/m³ R	10 mg/m³	500 mg/m³	Respiratory	Inhalation	Metal fume fever, chills, muscle aches, nausea, fever, dry throat, cough, weakness, lassitude, metallic taste, headache, blurred vision, low back pain, vomiting, fatigue, tight chest, breathing difficulty,	0	5.61 (water)			NO	odorless	IRIS D	NA	NA	NA	NA	NA	NA			81.4
* See Attached Notes								Not: Use - P1/T1= P2/T2 to obtain vp at 68F. Assume behaves as ideal gas.	— Note: Referenced to water at 39.2 F				Note: Used HSDB and 3M Resp. Selection Guide to obtain.	Note: Use IRIS or IARC for consistency	Response Factors are from the manuf. Can divide the response for benzene or isobutylene by response factor to get a correction factor		Response Factors are from the manuf. Can divide the response for methane by response factor to get a correction factor	Data based on calibration with isobutylene. Multiply actual reading times this correction factor to obtain concentration for that gas.		Data based on calibration with isobutylene. Multiply actual reading times this correction factor to obtain concentration for that gas.		

TABLE 4-1 (Cont.)
NOTES

( )	=	These are the 1989 Permissible exposure limits. They were vacated in 1994 and are no longer the legal limit.
a	=	These TLVs have not yet been adopted. ACGIH has placed them under notice of intended changes.
ACGIH	=	American Conference of Governmental Industrial Hygienists
b	=	The same information is listed for all Coal Tar Pitch Volatiles. The PEL/TLV is for all Coal Tar Pitch Volatiles combined. Separate PEL/TLVs have not been established to date
C	=	Ceiling Limit, shall not be exceeded at any time during the work day
CAS #	=	Chemical Abstracts Service Registry Number
D	=	Contaminant intake that should not induce adverse effects to human health or should not pose a risk of cancer occurrence greater than a predetermined risk level. Developed by US Army Medical Bioengineering R&D Laboratory. Expressed in mg/kg/day.
IARC	=	International Agency For Research on Cancer
IDLH	=	Immediately Dangerous to Life or Health
IRIS	=	Integrated Risk Information System
LOAEL	=	Lowest-Observed -Adverse Effect Level as determined by the USEPA/1989
LTE	=	Long Term Exposure Limit greater than 14 days as determined by USEPA/1989
MW	=	Molecular weight
mg/m^3	=	milligrams of contaminant per cubic meter of air
NA	=	Not Applicable
NE	=	Not Established
OSHA	=	Occupational Safety and Health Administration
PEL	=	Permissible Exposure Limit, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), mandated by law
ppm	=	parts of contaminant per million parts of air
R	=	Respirable Dust
Rfd	=	Chronic Oral Reference Dose as determined by the USEPA/1989
S	=	Short Term Exposure Limit (STEL) usually 15 minutes, four times in one day
S/5/2	=	STEL for 5 minutes, twice per day
Skin Hazard	=	Contaminant can be absorbed through intact skin.
STE	=	Short Term Exposure less than 14 days for minimal risk other than cancer as determined by USEPA/1989
T	=	Total Dust
TLV	=	Threshold Limit Value, unless noted is the TWA, Time Weighted Average (usually for 8 hours a day, 5 days a week), recommended
IRIS/IARC		Carcinogenic Category
A1		Human Carcinogen
B1 2A		Probable Human Carcinogen (limited human data)
B2 2B		Probable Human Carcinogen (sufficient in animals, inadequate evidence in humans).
C 3		Possible Human Carcinogen
D4		Not Classifiable
E		Evidence of Non-Carcinogen

Figures





0 2,000 4,000

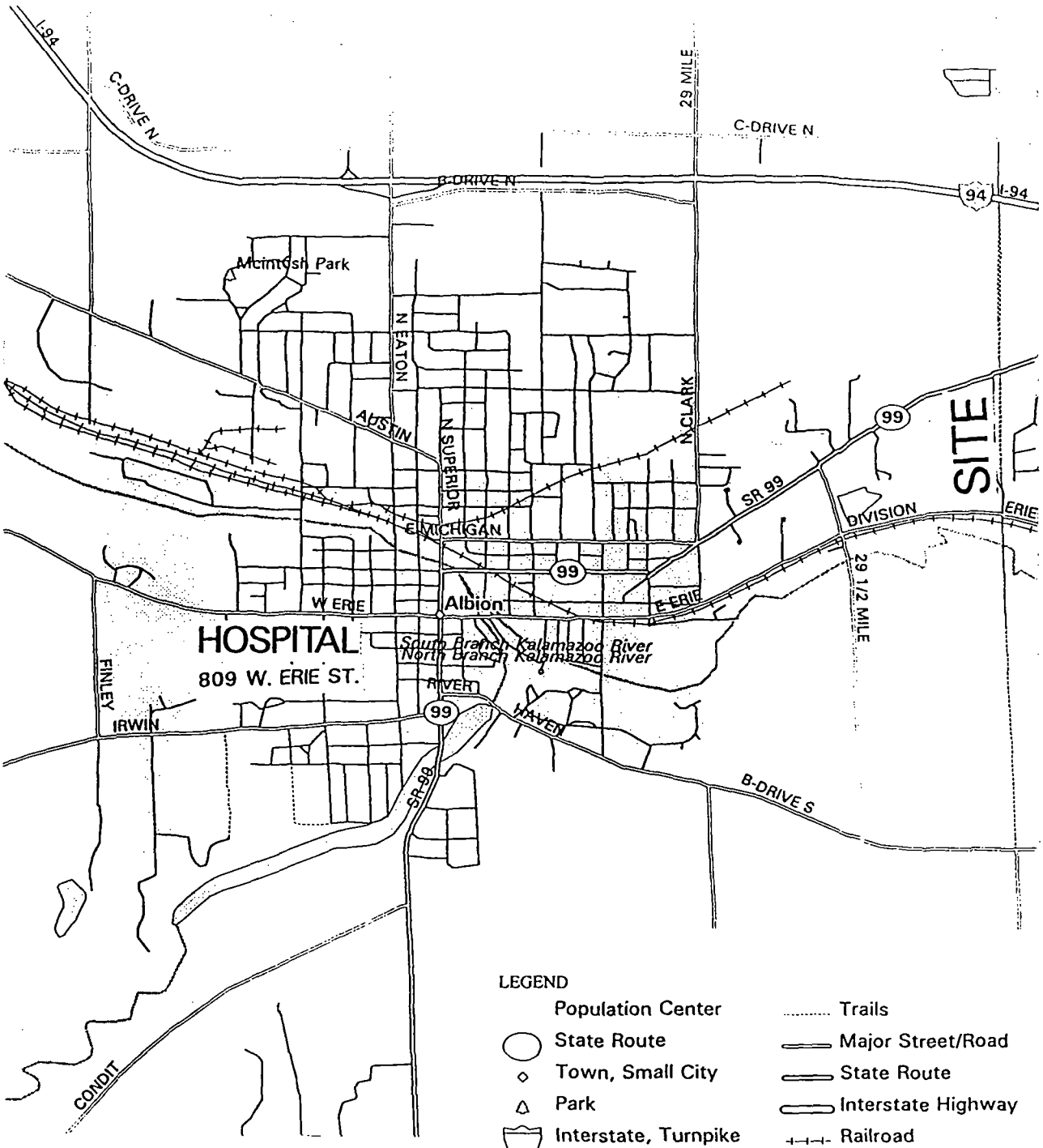
SCALE IN FEET

ALBION–SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN

Woodward-Clyde Consultants
ENGINEERS, GEOLOGISTS, AND ENVIRONMENTAL SCIENTISTS

SITE LOCATION MAP

DRN BY: SWH	DATE: MAR. 1996	PROJECT NO. 6E07013	FIG. NO. 1
CHK'D BY: DS	DATE: MAR. 1996		



LEGEND

- Population Center
- State Route
- Town, Small City
- Park
- Interstate, Turnpike
- County Boundary
- Street, Road
- Hwy Ramps
- Trails
- Major Street/Road
- State Route
- Interstate Highway
- Railroad
- River
- Open Water

Scale 1:31,250 (at center)
2000 Feet

1000 Meters

Mag 14.00
Thu May 30 09:48:43 1996

Woodward-Clyde Consultants
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HOSPITAL LOCATION MAP
ALBION–SHERIDAN TOWNSHIP LANDFILL
ALBION, MICHIGAN

DRN BY: SWH	DATE: MAY 1996	PROJECT NO. 6E07013	FIG. NO. 2
CHK'D BY: DS	DATE: MAY 1996		

A

APPENDIX A
MSDS SHEETS

aterial Safety Data Sheet

rom Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 385

ETHYL BENZENE
(Revision A)
Issued: August 1978
Revised: November 1988

ECTION 1. MATERIAL IDENTIFICATION

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol; $C_2H_5C_6H_5$; CAS No. 0100-41-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

NFPA

HMIS	
H 2	R 1
F 3	I 3
R 0	S 2
PPG*	K 4
*See sect. 8	

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
thyl Benzene, CAS No. 0100-41-4	Ca 100	OSHA PELs 8-Hr TWA: 100 ppm, 435 mg/m³ 15- Min STEL: 125 ppm, 545 mg/m³ ACGIH TLVs, 1988-89 TLV-TWA: 100 ppm, 435 mg/m³ TLV-STEL: 125 ppm, 545 mg/m³ Toxicity Data* Human, Inhalation, TC_{Lo}: 100 ppm (8 Hrs) Rat, Oral, LD_{50}: 3500 mg/kg
See NIOSH, *RTECS* (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.		

SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)
Melting Point: -139°F (-95°C)
Vapor Pressure: 7.1 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7
% Volatile by Volume: Ca 100
Molecular Weight: 106 Grams/Mole
Solubility in Water (%): Slight
Specific Gravity (H_2O = 1): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 64°F (18°C) CC	Autoignition Temperature: 810°F (432.22°C)	LEL: 1% v/v	UEL: 6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. **Unusual Fire or Explosion Hazards:** This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. **Conditions to Avoid:** Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. **Hazardous Products of Decomposition:** Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, respiratory system, and CNS. **Primary Entry:** Inhalation, skin contact **Acute Effects:** Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm dis-

[illegible] and laryngeal edema; euphoria; headache; giddiness; dizziness;

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 52

HYDROGEN SULFIDE
(Revision A)
Issued: July 1979
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION 25

Material Name: HYDROGEN SULFIDE

Description (Origin/Uses): Used as a reagent in analytical chemistry and in metallurgy; used to make heavy water.

Other Designations: Sulfureted Hydrogen; H_2S; NIOSH *RTECS* No. MX1225000; CAS No. 7783-06-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS	
H 4	
F 4	R 1
R 3	I 3
PPG*	S 2
*See sect. 8	K 4

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Hydrogen Sulfide, CAS No. 7783-06-4	*	IDLH** Level: 300 ppm OSHA PEL Ceiling:*** 20 ppm ACGIH TLVs, 1987-88 TLV-TWA: 10 ppm, 14 mg/m³ TLV-STEL: 15 ppm, 21 mg/m³ NIOSH REL 10-Min Ceiling: 10 ppm, 15 mg/m³ Toxicity Data**** Human, Inhalation, LC_{Lo}: 600 ppm (30 Mins)

*Contact your supplier to determine the exact composition of this gas and if any contaminants are present.
**Immediately dangerous to life and health.
***OSHA sets the maximum peak above ceiling PEL as 50 ppm only in an 8-hour shift with no other measurable exposures.
****See NIOSH, *RTECS*, for additional data.

SECTION 3. PHYSICAL DATA

Boiling Point: -76°F (-60°C)
Melting Point: -117°F (-83°C)
Vapor Density: 1.2
Vapor Pressure: >760 Torrs (Normal Atmospheric Pressure)

Water Solubility (%): At 68°F (20°C), 1 gram of H_2S dissolves in 242 ml of water.
Molecular Weight: 34 Grams/Mole

Appearance and Odor: A colorless gas; odor of rotten eggs. **Warning:** Paralysis of olfactory sense occurs at 200 ppm.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
Not Applicable	500°F (260°C)	% by Volume	4.3	46

Extinguishing Media: Hydrogen sulfide gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the gas; use a water spray to protect personnel attempting this. **Unusual Fire or Explosion Hazards; Danger:** Fire-exposed cylinders containing hydrogen sulfide gas can rupture violently. If it is safe to do so, remove them from the fire area or try to cool them with a direct water spray. This gas is denser than air and can travel a considerable distance to a low-lying source of ignition and flash back. It is flammable or explosive over a wide range of gas/air mixtures (see LEL and UEL). **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Fire fighters must use the maximum personal protective equipment available. Fight fires from explosion-proof or unmanned locations.

SECTION 5. REACTIVITY DATA

Hydrogen sulfide is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material is very reactive; hazardous reactions occur between it and strong oxidizing agents, nitric acid, soda lime, sodium, sodium peroxide, acetaldehyde, copper, and others (see Genium ref. 84, p. 491M-107).

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas because of the extreme flammability of hydrogen sulfide.

Hazardous Products of Decomposition: During fires hydrogen sulfide may produce toxic gases such as sulfur oxides (SO_x).

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Material Safety Data Sheets Collection:

Sheet No. 440
Methane

Issued: 7/80 Revision: A, 8/89

Section 1: Material Identification

Methane Description: Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.
Other Designations: Fire damp; marsh gas; methyl hydride; CH_4; CAS No. 0074-82-8.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R 1
I -
S -
K 4

NFPA

HMIS
H 1
F 4
R 0
PPG*
* Sec. 8

Section 2: Ingredients and Occupational Exposure Limits

Methane, ca 100%*

OSHA PEL	ACGIH TLV, 1988-89	NIOSH REL	Toxicity Data†
None established	None established	None established	Not listed

* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), higher molecular weight alkanes, carbon dioxide (CO_2), nitrogen (N_2), and oxygen(O_2).
† Monitor NIOSH, *RTECS* (PA1490000), for future toxicity data.

Section 3: Physical Data

Boiling Point: -259 °F (161.6 °C)
Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)
Molecular Weight: 16 g/mol
Water Solubility: Slight*
Melting Point: -296.5 °F (-182.5 °C)

Appearance and Odor: A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

*Soluble in alcohol and ether.

Section 4: Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)	Autoignition Temperature: 999 °F (537 °C)	LEL: 5% v/v*	UEL: 15% v/v*

Extinguishing Media: Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. *Treat any fire situation involving rapidly escaping and burning methane gas as an emergency.* Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.
Unusual Fire or Explosion Hazards: Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). Warning: Air with more than 14% by volume methane burns *noiselessly*. Methane burns with a pale, faintly luminous, not always easily detected flame.

Section 5: Reactivity Data

Stability/Polymerization: Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.
Conditions to Avoid: Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating elements, or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.
Hazardous Products of Decomposition: Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 317
TOLUENE
(Revision D)

Issued: August 1979
Revised: April 1986

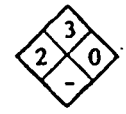
SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: TOLUENE

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C_7H_8, CAS #0108-88-3

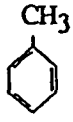
MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219, Columbus, OH; Telephone: (614) 889-3844

HMIS
H: 2
F: 3
R: 0
PPE*
*See sect. 8



R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Toluene 	ca 100	8-hr TLV: 100 ppm, or 375 mg/m^3* (Skin)** Man, Inhalation, TCLo: 100 ppm: Psychotropic*** Rat, Oral, LD_{50}: 5000 mg/kg Rat, Inhalation, LCLo: 4000 ppm/4 hrs. Rabbit, Skin, LD_{50}: 14 gm/kg Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14
Evaporation Rate (BuAc = 1) ... 2.24
Specific Gravity (H_2O = 1) ... 0.866
Melting Point ... -139°F (-95°C)
Percent Volatile by Volume ... ca 100
Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
40°F (4°C) CC	896°F (480°C)	% by Volume	1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetraoxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

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No. 382

VINYL CHLORIDE
(Revision A)
Issued: August 1978
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

Material Name: VINYL CHLORIDE

NFPA

Description (Origin/Uses): Widely used to make PVC resins and plastics; also used in organic synthesis.

Other Designations: VCM; Vinyl Chloride Monomer; Chloroethylene; Chloroethene; C_2H_3Cl; CAS No. 0075-01-4

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS
H 2
F 4
R 1
PPG*
*See sect. 8

R 1
I 4
S 3
K 4

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Vinyl Chloride, CAS No. 0075-01-4	Ca 100	OSHA PEL 8-Hr TWA: 1 ppm* ACGIH TLV, 1987-88 TLV-TWA: 5 ppm, 10 mg/m³ Toxicity Data** Rat, Oral, LD_{50}: 500 mg/kg

*The action level set by OSHA in 29 CFR 1910.1017 is 0.5 ppm. Exposures above this level are strictly regulated by extensive medical record keeping, reporting, surveillance, and other requirements. Consult 29 CFR 1910.1017 for details.

**See NIOSH, *RTECS* (No. KU9625000), for additional data with references to mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 61°F (16°C)
Water Solubility (%): Insoluble
Molecular Weight: 107 Grams/Mole
Vapor Density (Air = 1): 2.2

Appearance and Odor: A colorless gas; mild, sweet odor at high concentrations.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
-108.4°F (-78°C)	882°F (472°C)	% by Volume	3.6%	33%

Extinguishing Media: Vinyl chloride gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the flow of gas. Use a water spray to protect the personnel attempting this and to cool fire-exposed cylinders/containers of vinyl chloride.

Unusual Fire or Explosion Hazards: This heavier-than-air gas can flow along surfaces, reach distant sources of ignition, and flash back. Eliminate sources of ignition in the workplace, particularly in low-lying areas such as sumps, cellars, basement utility rooms, and underground piping systems.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Vinyl chloride is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It can undergo hazardous polymerization if it is heated or reacted with a polymerization catalyst, or if the concentration/activity of the added inhibitor becomes too low.

Chemical Incompatibilities: This material is incompatible with copper, aluminum, and other polymerization catalysts or free radical initiators like hydroquinone.

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas. Avoid prolonged exposure to air, especially in the presence of certain contaminants, because dangerous levels of polyperoxides may accumulate. Avoid exposure to sunlight; if the proper catalytic conditions occur, the vinyl chloride monomer may react with itself and undergo an explosive polymerization reaction. Violent ruptures of containers of this gas can occur.

Hazardous Products of Decomposition: During fires, vinyl chloride may decompose into toxic gases such as hydrogen chloride, carbon monoxide, and phosgene.

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No. 318

XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10}; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.

NFPA

HMIS	
H 2	R 1
F 3	I 3
R 0	S 2
PPG*	K 3

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

Xylene (Mixed Isomers), CAS No. 1330-20-7*

o-Xylene, CAS No. 0095-47-6
m-Xylene, CAS No. 0108-38-3
p-Xylene, CAS No. 0106-42-3

**Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

***Immediately dangerous to life and health.

**** See NIOSH, *RTECS* (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

%

**

EXPOSURE LIMITS

IDLH*** Level: 1000 ppm

OSHA PEL
8-Hr TWA: 100 ppm, 435 mg/m³

ACGIH TLVs, 1987-88
TLV-TWA: 100 ppm, 435 mg/m³
TLV-STEL: 150 ppm, 655 mg/m³

Toxicity Data****
Human, Inhalation, TC_{Lo}: 200 ppm
Man, Inhalation, LC_{Lo}: 10000 ppm/6 Hrs
Rat, Oral, LD_{50}: 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*
Melting Point: -13°F (-25°C)
Evaporation Rate: 0.6 Relative to BuAc = 1
Specific Gravity (H_2O = 1): 0.86

Water Solubility (%): Insoluble
Molecular Weight: 106 Grams/Mole
% Volatile by Volume: Ca 100
Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
81°F to 90°F (27°C to 32°C)	867°F (464°C)	% by Volume	1%	7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

SUDDEN RELEASE HAZARD: N

SECTION 16 OTHER

-ADDITIONAL INFORMATION-

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THIS INFORMATION IS PROVIDED WITHOUT ANY WARRANTY EXPRESS OR IMPLIED, REGARDING ITS CORRECTNESS. THE CONDITIONS OR METHODS OF HANDLING STORAGE, USE AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR KNOWLEDGE. WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR THE CONDITIONS OR METHODS.

chronic pneumonitis and mild anemia. Repeated exposure to mercury and its compounds may result in sensitization. Women occupationally exposed have reported menstrual disturbances, reduced ovulation and an increased risk of spontaneous abortion. Intrauterine exposure may result in tremors and involuntary movements in the infants. Mercury is excreted in breast milk. Reproductive effects have been reported in animals.

SKIN CONTACT:
MERCURY:
SENSITIZER/NEUROTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE- Direct contact with liquid may cause irritation and redness. Small amounts of mercury may be absorbed through intact skin. Allergic reactions that may occur in previously exposed persons include dermatitis, encephalitis, and death. Subcutaneous introduction, from handling broken thermometers, may result in local inflammation, granulomatous skin reactions, and slight signs of mercury poisoning including digestive disorders, metallic taste in the mouth, and neuropsychic disorders.
CHRONIC EXPOSURE- Prolonged or repeated exposure may result in dermal sensitization and systemic effects as detailed in chronic inhalation exposure.

EYE CONTACT:
MERCURY:
ACUTE EXPOSURE- Direct contact with liquid may cause irritation and redness. Animal studies indicate diffusion and absorption of mercury into the tissues of the eye may occur. No clinical signs of conjunctivitis or inflammation occurred.
CHRONIC EXPOSURE- Mercury exposure from inhalation, ingestion, or skin contact may be indicated by mercurialentis, discoloration of the crystalline lens, on slit lamp examination of the eye.

INGESTION:
MERCURY:
NEUROTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE- May cause burning of the mouth and throat, thirst, nausea and vomiting. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute toxic response. Rarely, a large single dose may result in signs and symptoms of chronic inhalation if sufficient amounts of mercury are retained in the body.
CHRONIC EXPOSURE- Repeated ingestion of small amounts of mercury may result in the absorption of sufficient amounts to produce toxic effects as detailed in chronic inhalation exposure.

SECTION 12 ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT RATING (0-4): no data available

ACUTE AQUATIC TOXICITY: no data available

DEGRADABILITY: no data available

LOG BIOCONCENTRATION FACTOR (BCF): no data available

LOG OCTANOL/WATER PARTITION COEFFICIENT: no data available

MELTING POINT: -38 F (-39 C)
VAPOR PRESSURE: 0.002 mmHg @ 25 C
VAPOR DENSITY: 7.0
SPECIFIC GRAVITY: 13.5939
WATER SOLUBILITY: insoluble
SOLVENT SOLUBILITY: Soluble in boiling sulfuric acid, nitric acid, lipids; insoluble in alcohol, ether, hydrochloric acid, hydrogen bromide, hydrogen iodide.

VISCOSITY: 1.55 cP @ 20 C

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY:
Stable under normal temperatures and pressures.

CONDITIONS TO AVOID:
May burn but does not ignite readily. Flammable, poisonous gases may accumulate in tanks and hopper cars. May ignite combustibles (wood, paper, oil, etc.).

INCOMPATIBILITIES:
MERCURY:
ACETYLENE: Formation of explosive compound.
ACETYLINIC COMPOUNDS: Formation of explosive compound.
ALUMINUM: Corrodes.
AMINES: May form explosive compounds.
AMMONIA + MOISTURE: Forms explosive compound.
BORON DIIODPHOSPHIDE: Ignites in contact with mercury vapors.
BROMINE: Violent reaction.
3-BROMOPROPYNE: Explosion hazard.
CALCIUM: Amalgam formation @ 390 C is violent.
CHLORINE: Ignites @ 200-300 C.
CHLORINE DIOXIDE: Explodes.
COPPER (AND ALLOYS): May be attacked.
ETHYLENE OXIDE + TRACES OF ACETYLENE: May form explosive acetylides.
LITHIUM: Amalgam formation is violently exothermic and may be explosive.
METHYL AZIDE: Produces shock sensitive mixture.
METHYLSILANE + OXYGEN: Produces shock sensitive mixture.
NITRIC ACID + ALCOHOLS: Forms fulminates capable of detonation.
OXALIC ACID: Forms shock sensitive compound.
OXIDANTS: Violent reaction.
PEROXYFORMIC ACID: Explosive reaction.
POTASSIUM: Amalgam formation is vigorously exothermic and may be explosive.
RUBIDIUM: Violent exothermic reaction.
SILVER PERCHLORATE + 3-HEXYNE: Explodes.
SILVER PERCHLORATE + 2-PENTYNE: Explodes.
SODIUM: Amalgam formation is violently exothermic.
SODIUM CARBIDE: Vigorous reaction.
SULFURIC ACID (HOT): Reacts.
TETRACARBONYLNICKEL + OXYGEN: Produces shock sensitive mixture.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products may include highly toxic vapors of mercury and mercury oxides.

SECTION 7 HANDLING AND STORAGE

Observe all federal, state and local regulations when storing this substance.

Store away from incompatible substances.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS:
MERCURY, ALL FORMS EXCEPT ALKYL (AS HG):
0.05 mg/m3 OSHA TWA (vapor) (skin); 0.1 mg/m3 OSHA ceiling (skin)
0.05 mg/m3 ACGIH TWA (vapor); 0.10 mg/m3 ACGIH TWA (aryl & inorganic) (skin)
(Notice of Intended Changes 1993-94)
0.05 mg/m3 NIOSH recommended TWA (vapor) (skin);
0.1 mg/m3 NIOSH recommended ceiling (skin)
0.01 ppm (0.1 mg/m3) DFG MAK TWA;
0.1 ppm (1.0 mg/m3) DFG MAK 30 minute peak, average value, 1 time/shift

MEASUREMENT METHOD: Hydrar(R) sorbent tube; acid; atomic absorption spectrometry (cold); (NIOSH Vol. III # 6009).

Subject to SARA Section 313 Annual Toxic Chemical Release Reporting
Subject to California Proposition 65 cancer and/or reproductive toxicity warning and release requirements- (July 1, 1990)

MERCURY:
1 pound CERCLA Section 103 Reportable Quantity

OSHA revoked the final rule limits of January 19, 1989 in response to the 11th Circuit Court of Appeals decision (AFL-CIO v. OSHA) effective June 30, 1993. See 29 CFR 1910.1000 (58 FR 35338)

VENTILATION:
Provide local exhaust ventilation system to meet published exposure limits.

EYE PROTECTION:
Employee must wear splash-proof or dust-resistant safety goggles and a faceshield to prevent contact with this substance.

Emergency wash facilities:
Where there is any possibility that an employee's eyes and/or skin may be exposed to this substance, the employer should provide an eye wash fountain and quick drench shower within the immediate work area for emergency use.

CLOTHING:
Employee must wear appropriate protective (impervious) clothing and equipment to prevent any possibility of skin contact with this substance.

GLOVES:
Employee must wear appropriate protective gloves to prevent contact with this substance.

RESPIRATOR:
The following respirators and maximum use concentrations are recommendations by the U.S. Department of Health and Human Services, NIOSH Pocket Guide to Chemical Hazards; NIOSH criteria documents or by the U.S. Department of

EYE CONTACT:
SHORT TERM EFFECTS: May cause irritation.
LONG TERM EFFECTS: No information available on significant adverse effects.
INGESTION:
SHORT TERM EFFECTS: May cause thirst, nausea, vomiting, kidney damage and nerve damage.
LONG TERM EFFECTS: No information available on significant adverse effects.

CARCINOGEN STATUS:
OSHA: N
NTP: N
IARC: N

SECTION 4 FIRST AID MEASURES

INHALATION:
FIRST AID- Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Maintain airway and blood pressure and administer oxygen if available. Keep affected person warm and at rest. Treat symptomatically and supportively. Administration of oxygen should be performed by qualified personnel. Get medical attention immediately.

SKIN CONTACT:
FIRST AID- Remove contaminated clothing and shoes immediately. Wash affected area with soap or mild detergent and large amounts of water until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

EYE CONTACT:
FIRST AID- Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains (approximately 15-20 minutes). Get medical attention immediately.

INGESTION:
FIRST AID- Remove by gastric lavage or emesis. Maintain blood pressure and airway. Give oxygen if respiration is depressed. Do not perform gastric lavage or emesis if victim is unconscious. Get medical attention immediately (Dreisbach, Handbook of Poisoning, 12th Ed.). Administration of gastric lavage or oxygen should be performed by qualified medical personnel.

NOTE TO PHYSICIAN
ANTIDOTE:
The following antidote has been recommended. However, the decision as to whether the severity of poisoning requires administration of any antidote and actual dose required should be made by qualified medical personnel.

MERCURY POISONING:
Give dimercaprol, 3 mg/kg (or 0.3 mL/10 kg) every 4 hours for the first 2 days and then 2 mg/kg every 12 hours for a total of 10 days if necessary. Dimercaprol is available as a 10% solution in oil for intramuscular administration. Hemodialysis will speed the removal of the mercury-dimercaprol complex. Penicillamine is also effective. Give up to 100 mg/kg/day (maximum 1 gr/day) divided into 4 doses for no longer than 1 week. If a longer administration period is warranted, dosage should not exceed 40 mg/kg/day.

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ACETONE
FORMULA: (CH3)2CO
FORMULA WT: 58.08
CAS NO.: 67-64-1
NIOSH/RTECS NO.: AL3150000
COMMON SYNONYMS: DIMETHYL KETONE; METHYL KETONE; 2-PROPANONE
PRODUCT CODES: 9010,9006,9002,9254,9009,9001,9004,5356,A134,9007,9005,9005 9008
EFFECTIVE: 08/27/86
REVISION #02

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT
FLAMMABILITY - 3 SEVERE (FLAMMABLE)
REACTIVITY - 2 MODERATE
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

PRECAUTIONARY LABEL STATEMENTS

DANGER
CAUSES IRRITATION
EXTREMELY FLAMMABLE
HARMFUL IF SWALLOWED OR INHALED

KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.

MELTING POINT: -95 C (-139 F) VAPOR DENSITY(AIR=1): 2.0

SPECIFIC GRAVITY: 0.79 (H2O=1) EVAPORATION RATE: ~10 (BUTYL ACETATE=1)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID WITH A FRAGRANT SWEET ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: -18 C (0 F) NFPA 704M RATING: 1-3-0

FLAMMABLE LIMITS: UPPER - 13.0 % LOWER - 2.6 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.
(WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK.

INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.

CHRONIC EFFECTS OF OVEREXPOSURE MAY INCLUDE KIDNEY AND/OR LIVER DAMAGE.

TARGET ORGANS
RESPIRATORY SYSTEM, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT
LEAST 15 MINUTES. FLUSH SKIN WITH WATER.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, SOURCES OF IGNITION

INCOMPATIBLES: HALOGEN ACIDS AND HALOGEN COMPOUNDS, STRONG BASES,
STRONG OXIDIZING AGENTS, CAUSTICS, AMINES AND AMMONIA, CHLORINE AND CHLORINE COMPOUNDS,
STRONG ACIDS, ESP. SULFURIC, NITRIC, HYDROCHLORIC

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE
CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 5000 PPM, A GAS MASK WITH ORGANIC VAPOR CANNISTER IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS WITH FULL FACE SHIELD IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GLASSES WITH SIDESHIELDS, BUTYL RUBBER
GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: RED (FLAMMABLE)

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID. KEEP CONTAINER
TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID
STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME ACETONE
HAZARD CLASS FLAMMABLE LIQUID
UN/NA UN1090

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ALUMINUM
FORMULA: AL
FORMULA WT: 26.98
CAS NO.: 07429-90-5
NIOSH/RTECS NO.: BD0330000
PRODUCT CODES: 0446
EFFECTIVE: 10/01/85
REVISION #01

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 1 SLIGHT
FLAMMABILITY - 4 EXTREME (FLAMMABLE)
REACTIVITY - 2 MODERATE
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING

DUST MAY FORM FLAMMABLE AND EXPLOSIVE MIXTURE WITH AIR, ESPECIALLY
WHEN DAMP.
KEEP AWAY FROM HEAT, SPARKS, FLAME.
AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
VENTILATION. IN CASE OF FIRE, SOAK WITH WATER. IN CASE OF SPILL, SWEEP UP AND

(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: N/A

APPEARANCE & ODOR: SILVERY-WHITE, ODORLESS METAL POWDER.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A NFPA 704M RATING: 0-1-1

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE DRY CHEMICAL OR CARBON DIOXIDE. DO NOT USE WATER.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
(POSITIVE PRESSURE IF AVAILABLE) BREATHING APPARATUS WITH FULL FACEPIECE.
MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.
USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

5 - HEALTH HAZARD DATA

STRONG BASES, COMBUSTIBLE MATERIALS, WATER

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA.
DO NOT TOUCH SPILLED MATERIAL.
DO NOT PUT ANY WATER ON LEAK OR SPILLS.
DO NOT GET WATER INSIDE CONTAINER.
WITH CLEAN SHOVEL, PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER.
MOVE CONTAINER(S) FROM SPILL AREA.
FLUSH AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION
CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS
HIGH, A DUST/MIST RESPIRATOR IS RECOMMENDED.
IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR,
A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	ALUMINUM, POWDER UNCOATED, (NON-PYROPHORIC)
HAZARD CLASS	4.3
UN/NA	UN1396
LABELS	DANGEROUS WHEN WET

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: AMMONIA SOLUTION
FORMULA: NH3 IN H2O
FORMULA WT: 17.03
CAS NO.: 1336-21-6
NIOSH/RTECS NO.: BQ9625000
COMMON SYNONYMS: AMMONIUM HYDROXIDE; AQUA AMMONIA
PRODUCT CODES: 9726,9724
EFFECTIVE: 09/03/86
REVISION #03

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)
FLAMMABILITY - 1 SLIGHT
REACTIVITY - 2 MODERATE
CONTACT - 3 SEVERE (CORROSIVE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
CAUSES BURNS
MAY BE FATAL IF SWALLOWED
VAPOR EXTREMELY IRRITATING
EXCEPTIONAL HEALTH AND CONTACT HAZARDS - READ MATERIAL SAFETY DATA SHEET
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

MELTING POINT: -78 C (-108 F) VAPOR DENSITY(AIR=1): N/A

SPECIFIC GRAVITY: 0.90 (H2O=1) EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): COMPLETE (IN ALL PROPORTIONS) % VOLATILES BY VOLUME: 100

APPEARANCE & ODOR: CLEAR COLORLESS SOLUTION WITH A STRONG ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A NFPA 704M RATING: 3-1-0

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE EXPOSED CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK.
USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL; DO NOT GET WATER INSIDE
CONTAINERS.

UNUSUAL FIRE & EXPLOSION HAZARDS
GIVES OFF FLAMMABLE VAPORS. VAPORS MAY FORM EXPLOSIVE MIXTURE WITH AIR.
CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE.

BLINDNESS MAY OCCUR.
INGESTION MAY CAUSE SEVERE BURNING OF MOUTH AND STOMACH.
INGESTION IS HARMFUL AND MAY BE FATAL.

TARGET ORGANS
RESPIRATORY SYSTEM, EYES

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, DO NOT INDUCE VOMITING; IF CONSCIOUS, GIVE LARGE AMOUNTS OF
WATER. FOLLOW WITH DILUTED VINEGAR, FRUIT JUICE OR WHITES OF EGGS, BEATEN
WITH WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
WASH CLOTHING BEFORE RE-USE.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE
CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 25 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH AMMONIA/AMINE CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: WHITE STRIPE (STORE SEPARATELY)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN CORROSION-PROOF AREA. STORE BELOW 25 C.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME AMMONIUM HYDROXIDE (12-44% AMMONIA)
HAZARD CLASS CORROSIVE MATERIAL (LIQUID)
UN/NA NA2672
LABELS CORROSIVE
REPORTABLE QUANTITY 100 LBS.

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ANTIMONY
FORMULA: SB
FORMULA WT: 121.75
CAS NO.: 07440-36-0
NIOSH/RTECS NO.: CC4025000
COMMON SYNONYMS: STIBIUM, C.I. 77050
PRODUCT CODES: 0848
EFFECTIVE: 08/27/86
REVISION #03

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (POISON)
FLAMMABILITY - 1 SLIGHT
REACTIVITY - 2 MODERATE
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

POISON DANGER
MAY BE FATAL IF INHALED
CAUSES IRRITATION

AVOID CONTACT WITH EYES, SKIN, CLOTHING.
DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
VENTILATION. WASH THOROUGHLY AFTER HANDLING.

(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: SILVER-WHITE, HARD, BRITTLE METAL.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

UNUSUAL FIRE & EXPLOSION HAZARDS
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 0.5 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.5 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
INHALATION MAY BE HARMFUL OR FATAL.
PROLONGED EXPOSURE MAY CAUSE DERMATITIS.

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, LIGHT

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG ACIDS, HALOGEN ACIDS,
CHLORINE, FLUORINE

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET
TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE
CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1 PPM, A DUST/MIST RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME ANTIMONY, POWDER
HAZARD CLASS 6.1
UN/NA UN2871
LABELS HARMFUL - STOW AWAY FROM FOOD STUFFS

Common Name: Arsenic
CAS Number: 7440-38-2
DOT Number: UN 1558
Date: November, 1986

HAZARD SUMMARY

* Arsenic can affect you when breathed in and may enter through the skin.
* Arsenic is a CARCINOGEN//HANDLE WITH EXTREME CAUTION.
* It may damage the developing fetus.
* Skin contact can cause burning, itching, thickening and color changes.
* High or repeated exposure can damage nerves, with "pins and needles," numbness, and weakness of arms and legs as well as poor appetite, nausea, stomach cramps, nose ulcers, hoarseness, or damage to the liver, blood vessels, or red blood cells.
* Arsenic near acid or acid mist can release a VERY DEADLY gas, Arsine.

IDENTIFICATION

Arsenic is a silver-gray brittle, crystalline solid. It also exists in black and yellow amorphous forms. It is used as an alloying agent for heavy metals, in special solders and in medicine.

REASON FOR CITATION

* Arsenic is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, NIOSH, IARC, DOT and other authorities.
* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health

immediately or shortly after exposure to Arsenic:

* Skin contact can cause burning, itching and a rash.
* Breathing Arsenic, such as in liquid spray or powder form, can cause nose and throat irritation.
* Eye contact can cause red, watery eyes and irritation.
* High exposures can cause poor appetite, nausea, vomiting and muscle cramps.
* Heart effects with an abnormal EKG can also occur with very high exposures.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to Arsenic and can last for months or years:

Cancer Hazard

* Arsenic is a CARCINOGEN in humans. It has been shown to cause skin and lung cancer.
* Many scientists believe there is no safe level of exposure to a CARCINOGEN. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* Arsenic may damage the developing fetus.
* Arsenic should be handled as a potential teratogenic agent since some Arsenic compounds are known teratogens.

Other Long-Term Effects

* Long-term exposure can cause an ulcer or hole in the "bone" dividing the inner nose. Hoarseness and sore eyes also occur.
* High or repeated exposure can cause nerve damage, with "pins and needles," burning, numbness, and later weakness of arms and legs.
* Repeated skin contact can cause thickened skin and/or patchy areas of darkening and loss of pigment. Some persons develop white lines on the nails.
* Repeated exposure can also damage the liver, cause narrowing of the blood vessels, or interfere with the bone marrow's ability to make red blood cells.

MEDICAL

and/or provide local exhaust ventilation at the site of calc al release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:

* Where possible, automatically transfer Arsenic from drums or other storage containers to process containers.
* Specific engineering controls are recommended for this chemical by NIOSH. Refer to the NIOSH criteria document: Inorganic Arsenic # 75-149.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by Arsenic should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Arsenic.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* Wash any areas of the body that may have contacted Arsenic at the end of each workday, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where Arsenic is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Use a vacuum or a wet method to reduce dust during clean-up. Do not dry sweep.
* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, not a standard shop vacuum.

proper handling and storage.

* Arsenic must be stored to avoid contact with OXIDIZERS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES and NITRATES) and STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC) since violent reactions occur.
* A regulated area should be established where Arsenic is handled, used, or stored.
* Store in tightly closed containers in a cool well-ventilated area away from FOOD and COMBUSTIBLE MATERIALS.

Common Name: Arsenic
DOT Number: UN 1558
DOT Emergency Guide code: 53
CAS Number: 7440-38-2

NJ DOH Hazard rating
FLAMMABILITY Not Found
REACTIVITY Not Found

POISONOUS GAS IS PRODUCED IN FIRE
CARCINOGEN

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Use dry chemical, CO2, water spray, or foam extinguishers.
* POISONOUS GAS IS PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES
If Arsenic is spilled, take the following steps:

* Restrict persons not wearing protective equipment from area of spill until clean-up is complete.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* It may be necessary to contain and dispose of Arsenic as a

CN 368, Trenton, NJ 08625-0368
(609) 984-2202

ECOLOGICAL INFORMATION

Arsenic is a naturally occurring element which is used to make glass, cloth, and electrical semiconductors. It is also commonly used in fungicides, wood preservatives, growth stimulants for plants and animals, and in veterinary uses. Arsenic enters the environment mainly from its use as a pesticide and from emissions from coal-fueled power plants.

ACUTE (SHORT-TERM) ECOLOGICAL EFFECTS

Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen two to four days after animals or plants come in contact with a toxic chemical substance.

Arsenic metabolism and effects are significantly influenced by the animal/plant tested, the route of administration, the physical and chemical form of the arsenical, and the dose. Inorganic arsenic compounds are more toxic than organic arsenic compounds.

Arsenic has high acute toxicity to aquatic life, birds, and land animals. Except where soil arsenic content is high (around smelters and where arsenic-based pesticides have been used heavily), arsenic does not accumulate in plants to toxic levels. Where soil arsenic content is high, growth and crop yields can be decreased.

CHRONIC (LONG-TERM) ECOLOGICAL EFFECTS

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure(s) to a toxic chemical.

Arsenic has high chronic toxicity to aquatic life, and moderate

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CHROMIUM
FORMULA: CR
FORMULA WT: 52.00
CAS NO.: 7440-47-3
NIOSH/RTECS NO.: CB4200000
PRODUCT CODES: 4961
EFFECTIVE: 09/10/86
REVISION #03

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

2 - HAZARDOUS COMPONENTS

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

5 - HEALTH HAZARD DATA

NOTE: WHILE THE SPECIFIC COMPOUNDS CANNOT BE IDENTIFIED, THERE IS EVIDENCE THAT CERTAIN CHROMIUM COMPOUNDS CAUSE CANCER IN HUMANS AND
EXPERIMENTAL ANIMALS. CHROMIUM IS WIDELY DISTRIBUTED IN AIR, WATER, SOIL
AND FOOD. TRIVALENT CHROMIUM MAY BE AN ESSENTIAL TRACE INGREDIENT IN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION

EMERGENCY AND FIRST AID PROCEDURES
INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE
LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.
INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED
PERSON TO FRESH AIR. GET MEDICAL ATTENTION.
EYE CONTACT: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15
MINUTES. GET MEDICAL ATTENTION.
SKIN CONTACT: IMMEDIATELY WASH WITH PLENTY OF SOAP AND WATER FOR AT LEAST
15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: FLAME

INCOMPATIBLES: CARBONATES, STRONG BASES, MINERAL ACIDS

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE
AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME CHROMIUM
HAZARD CLASS ORM-E
LABELS NONE
REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: COPPER
FORMULA: CU
FORMULA WT: 63.55
CAS NO.: 07440-50-8
NIOSH/RTECS NO.: GL5325000
COMMON SYNONYMS: BRONZE POWDER; C.I. 77400; ARWOOD COPPER
PRODUCT CODES: 1732,1736,1720,1714,1728
EFFECTIVE: 06/25/86
REVISION #02

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 1 SLIGHT

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

CAUTION
MAY CAUSE IRRITATION
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: REDDISH, LUSTROUS, MALLEABLE METAL.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

TOXIC GASES PRODUCED
COPPER FUMES

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
DUST MAY CAUSE SNEEZING AND COUGHING.
DUST MAY IRRITATE SKIN OR EYES.
PROLONGED EXPOSURE MAY CAUSE DERMATITIS.
INGESTION MAY CAUSE NAUSEA, VOMITING, HEADACHES, DIZZINESS, GASTROINTESTINAL IRRITATION.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, ACTIVE HALOGEN COMPOUNDS, CHLORINE, FLUORINE, IODINE, BROMINE, AMMONIA

DECOMPOSITION PRODUCTS: COPPER FUMES

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS

HAZARD CLASS ORM-E
LABELS NONE
REPORTABLE QUANTITY 5000 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

E I DUPONT -- 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)
MATERIAL SAFETY DATA SHEET
FSC: 6850
Manufacturer's CAGE: 51851
Part No. Indicator: A
Part Number/Trade Name: 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)

General Information

Company's Name: E I DUPONT DE NEMOURS & CO
Company's Street: 331 TREBLE COVE RD
Company's City: NORTH BILLERICA
Company's State: MA
Company's Country: US
Company's Zip Code: 01862
Company's Emerg Ph #: 800-483-7616;800-424-9300(CHEMTREC)
Company's Info Ph #: 508-667-9538;800-441-3637
Safety Data Action Code: A
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01AUG90
Safety Data Review Date: 28FEB95
MSDS Serial Number: BWRVS

Ingredients/Identity Information

Proprietary: NO
Ingredient: BENZENE, 1,2,4-TRIMETHYL-; (1,2,4-TRIMETHYLBENZENE) (SARA 313)
Ingredient Sequence Number: 01
Percent: 100
Ingredient Action Code: A
NIOSH (RTECS) Number: DC3325000
CAS Number: 95-63-6
OSHA PEL: 25 PPM
ACGIH TLV: 25 PPM

EYE WASH FOUNTAIN & QUICK DRENCH SHOWER SHOULD BE (ING 7)
Ingredient Sequence Number: 06
Ingredient Action Code: A
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6:W/IN THE IMMEDIATE WORK AREA.
Ingredient Sequence Number: 07
Ingredient Action Code: A
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID W/AROMATIC ODOR.
Boiling Point: 336F,169C
Melting Point: -47F,-44C
Vapor Pressure (MM Hg/70 F): 1.7 @ 20C
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: 112F,44C
Flash Point Method: CC
Lower Explosive Limit: 0.9%
Upper Explosive Limit: 6.4%
Extinguishing Media: DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR
ALCOHOL FOAM.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE
EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: MOD FIRE HAZ WHEN EXPOSED TO HEAT/FLAME.

WT GAIN, PROGRESSIVELY INCR LYMPHOPENIA & NEUTROPHILIA & A MARKED CNS
DEPRESS OBSERVED IN ANIMALS. SKIN:MAY CAUSE DERMATITIS. EYE:MAY CAUSE
CONJUNCTIVITIS. INGEST:NO DATA AVAILABLE.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INHAL:REMOVE FROM EXPOS AREA TO FRESH AIR IMMED.
IF BRTHG HAS STOPPED, PERFORM ARTF RESP. KEEP PERS WARM & AT REST. TREAT
SYMPTOMATICALLY & SUPPORTIVELY. GET MED ATTN IMMED. SKIN:REMOVE CONTAM
CLTHG & SHOES IMMED. WASH AFFECTED AREA W/SOAP OR MILD DETERGENT & LG AMTS
OF WATER UNTIL NO EVID OF CHEM REMAINS (APPROX 15-20 MINS). GET MED ATTN
IMMED. EYES:WASH IMMED W/LG AMTS OF WATER/NORMAL (SUPDAT)

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SM SPILLS:SHUT OFF IGNIT SOURCES. STOP LEAK
IF YOU CAN DO IT W/OUT RISK. USE WATER SPRAY TO REDUCE VAPS. TAKE UP W/SAND
OR OTHER ABSORB MATL & PLACE INTO CNTNRS FOR LATER DISP. NO SMOKING,
FLAMES/FLARES IN HAZ AREA. ISOLATE HAZ AREA & DENY ENTRY.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSAL MUST BE I/A/W FEDERAL, STATE & LOCAL REGULATIONS (FP N). DISPOSAL MUST BE I/A/W STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZ WASTE NUMBER D001.
Precautions-Handling/Storing: AVOID CONTACT W/HEAT, SPARKS, FLAMES OR OTHER SOURCES OF IGNITION. VAPORS MAY BE EXPLOSIVE & POISONOUS; DO NOT
ALLOW UNNECESSARY PERSONNEL IN AREA.
Other Precautions: DO NOT OVERHEAT CONTAINERS; CONTAINERS MAY VIOLENTLY
RUPTURE & TRAVEL A CONSIDERABLE DISTANCE IN HEAT OF FIRE. STORE I/A/W 29

Label Date: 28FEB95
Label Status: M
Common Name: 1,2,4-TRIMETHYLBENZENE (PSEUDOCUMENE)
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-Moderate: X
Reactivity Hazard-None: X
Special Hazard Precautions: ACUTE:INHALATION, SKIN & EYE IRRITANT.
NARCOTIC. MODERATELY TOXIC BY INHALATION & INGESTION. INHAL:MAY CAUSE
SYSTEMIC TOXICITY DUE TO ABSORPTION IS NOT PROBABLE. EYE:MAY CAUSE
IRRITATION. INGEST:NO SYMPTOMS WERE FOUND. CHRONIC:INHALATION:ASTHMATIC
BRONCHITIS, HEADACHE, FATIGUE, TENSION, ANXIETY, NERVOUSNESS AND DROWSINESS
OBSERVED IN EXPOSED WORKERS. DEPRESSED WEIGHT GAIN, PROGRESSIVELY
INCREASING LYMPHOPENIA AND NEUTROPHILIA AND A MARKED CENTRAL NERVOUS SYSTEM
DEPRESSION OBSERVED IN ANIMALS. SKIN:MAY CAUSE DERMATITIS. EYES:MAY CAUSE
CONJUNCTIVITIS.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: E I DUPONT DE NEMOURS & CO
Label Street: 331 TREBLE COVE RD
Label City: NORTH BILLERICA
Label State: MA
Label Zip Code: 01862
Label Country: US
Label Emergency Number: 800-483-7616;800-424-9300(CHEMTREC)

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: LEAD, GRANULAR OR SHOT
FORMULA: PB
FORMULA WT: 207.19
CAS NO.: 7439-92-1
NIOSH/RTECS NO.: OF7525000
COMMON SYNONYMS: C.I. 77575
PRODUCT CODES: 4996,2256,2266
EFFECTIVE: 11/25/86
REVISION #02

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING
MAY BE FATAL IF SWALLOWED
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

(H2O=1) (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: GRAYISH-WHITE, SILVERY METAL, WITH NO ODOR.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

TOXIC GASES PRODUCED
LEAD FUMES

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 0.15 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.05 MG/M3 (PPM)

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED IN LARGE AMOUNTS, MOVE EXPOSED PERSON TO FRESH AIR.
GET MEDICAL ATTENTION.
IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT
LEAST 15 MINUTES. GET MEDICAL ATTENTION.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF SOAP AND WATER
FOR AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

INCOMPATIBLES: STRONG OXIDIZING AGENTS, POTASSIUM METAL, SODIUM METAL

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL

SPECIAL PRECAUTIONS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME LEAD
HAZARD CLASS ORM-E
LABELS NONE
REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

MAYS CHEMICAL -- ZINC OXIDE
MATERIAL SAFETY DATA SHEET
FSC: 6810
NIIN: 00D003155
Manufacturer's CAGE: 6T060
Part No. Indicator: A
Part Number/Trade Name: ZINC OXIDE

General Information

Company's Name: MAYS CHEMICAL CO., INC.
Company's Street: 7760 E. 89TH STREET
Company's P. O. Box: 50927
Company's City: INDIANAPOLIS
Company's State: IN
Company's Country: US
Company's Zip Code: 46256
Company's Emerg Ph #: 317-842-8722
Company's Info Ph #: 317-842-8722
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SM
Date MSDS Prepared: 06APR89
Safety Data Review Date: 01FEB94
Supply Item Manager: CX
MSDS Serial Number: BSHQQ
Hazard Characteristic Code: T6
Report for NIIN: 00D003155

Ingredients/Identity Information

Proprietary: NO
Ingredient: ZINC OXIDE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: ZH4810000
CAS Number: 1314-13-2
OSHA PEL: 15 MG/M3 TDUST

Stability: YES
Cond To Avoid (Stability): HIGH TEMPERATURES.
Materials To Avoid: CHLORINATED RUBBER; REACTS VIOLENTLY W/MAGNESIUM,
LINSEED OIL. W/ MAGNESIUM CAN REACT EXPLOSIVELY WHEN HEATED.
Hazardous Decomp Products: SUBLIMES TO PRODUCE TOXIC FUMES.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): N/A.

Health Hazard Data

Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE:SKIN/EYE:IRRITATION. INHAL:IRRI
RESPIRATORY TRACT. NUISANCE DUST CAN CAUSE UNPLEASANT DEPOSITS IN NASAL
PASSAGES. HI CONC ZINC CHILLS MAY OCCUR. INGEST:EXCESSIVE ORAL DOSES MAY
CAUSE INTESTINAL OBSTRUCTION. CHRONIC:PER MFG'S MSDS NO INFORMATION FOUND.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
COUGHIHG, SHORTNESS OF BREATH, ZINC CHILL---WEAKNESS, FATIGUE, NAUSEA,
CHILLS. INGEST:NAUSEA, FEVER, STOMACH CRAMPS, INTESTINAL OBSTRUCTION.
Med Cond Aggravated By Exp: PRE-EXISTING HEART CONDITION OR IMPAIRED
RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF THIS
MATERIAL.
Emergency/First Aid Proc: INHAL:REMOVE TO FRESH AIR. SEE DOCTOR FOR ANY
BREATHING DIFFICULTY. INGEST:GIVE SEVERAL GLASSES OF WATER TO DILUTE. IF LG
AMTS OF MATERIAL WERE SWALLLOWED, SEE DOCTOR. SKIN:WASH W/SOAP & WATER. SEE
DOCTOR IF IRRITATION DEVELOPS. EYE:WASH THOROUGHLY W/WATER. SEE DOCTOR IF

DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
Report for NIIN: 00D003155

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 01FEB94
Label Status: F
Common Name: ZINC OXIDE
Chronic Hazard: N/P
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: SKIN/EYE:IRRIT. INHAL:IRRIT RESP TRACT.
NUISANCE DUST CAN CAUSE UNPLEASANT DEPOSITS IN NASAL PASSAGES.HI CONC ZINC
CHILLS MAY OCCUR. INGEST:EXCESS ORAL DOSES MAY CAUSE INTESTINAL OBSTRUCTION. CHRONIC:PER MFG'S MSDS NO INFOR FOUND. TARGET ORGANS:EYE/SKIN/
Report for NIIN: 00D003155
RESP SYS/INTESTINAL SYS. 1STAID:INHAL:REMOVE TO FRESH AIR.SEE DOCTOR FOR

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: NICKEL, SHOT
FORMULA: NI
FORMULA WT: 58.71
CAS NO.: 07440-02-0
NIOSH/RTECS NO.: QR5950000
PRODUCT CODES: 2748
EFFECTIVE: 09/03/86
REVISION #03

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 3 SEVERE (CANCER CAUSING)
FLAMMABILITY - 0 NONE
REACTIVITY - 0 NONE
CONTACT - 3 SEVERE (LIFE)

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

WARNING
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN
MAY CAUSE ALLERGIC REACTION.
EXCEPTIONAL CONTACT HAZARD - READ MATERIAL SAFETY DATA SHEET
NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING.

SPECIFIC GRAVITY: 8.90 (H2O=1) EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: GRAY, SPHERICAL PELLETS.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (OPEN CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.
MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER
TO KEEP FIRE-EXPOSED CONTAINERS COOL.

TOXIC GASES PRODUCED
NICKEL FUMES

5 - HEALTH HAZARD DATA

THIS SUBSTANCE IS LISTED AS NTP ANTICIPATED HUMAN CARCINOGEN, IARC PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B).

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH PLENTY OF WATER FOR
AT LEAST 15 MINUTES.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG ACIDS, AMMONIA, ALUMINUM, STRONG OXIDIZING AGENTS

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME NICKEL
HAZARD CLASS ORM-E
LABELS NONE
REPORTABLE QUANTITY 1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: ZINC
FORMULA: ZN
FORMULA WT: 65.37
CAS NO.: 7440-66-6
NIOSH/RTECS NO.: ZG8600000
COMMON SYNONYMS: BLUE POWDER
PRODUCT CODES: 4244,4290,4240,4252,4260,4248,4274,5828,4264,4270
EFFECTIVE: 06/25/86
REVISION #02

PRECAUTIONARY LABELLING
BAKER SAF-T-DATA(TM) SYSTEM

HEALTH - 0 NONE
FLAMMABILITY - 1 SLIGHT
REACTIVITY - 2 MODERATE
CONTACT - 0 NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

SAFETY GLASSES; LAB COAT

PRECAUTIONARY LABEL STATEMENTS

WARNING
CAUSES IRRITATION
DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER
HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

SAF-T-DATA(TM) STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: BLUISH-WHITE ODORLESS SOLID.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

UNUSUAL FIRE & EXPLOSION HAZARDS
REACTS VIOLENTLY WITH WATER LIBERATING AND IGNITING HYDROGEN.

5 - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 10 MG/M3 (PPM)

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

EFFECTS OF OVEREXPOSURE
CONTACT WITH SKIN OR EYES MAY CAUSE SEVERE IRRITATION OR BURNS.
INHALATION OF DUST MAY CAUSE IRRITATION TO UPPER RESPIRATORY TRACT.
PROLONGED EXPOSURE MAY CAUSE DERMATITIS.
NOTE: PRODUCT IS A SOLID MASS; HOWEVER, WARNINGS ARE BASED ON INHALATION

STABILITY: UNSTABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: MOISTURE

INCOMPATIBLES: STRONG ACIDS, STRONG BASES, STRONG OXIDIZING AGENTS,
ALKALI METALS, HALOGENATED HYDROCARBONS

DECOMPOSITION PRODUCTS: OXIDES OF ZINC

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

8 - PROTECTIVE EQUIPMENT

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION
TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION
CONDITIONS EXIST. IF AIRBORNE CONCENTRATION IS
HIGH, USE AN APPROPRIATE RESPIRATOR OR DUST MASK.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME CHEMICALS, N.O.S. (NON-REGULATED)

OPERATING PROCEDURES NO. HS-201

201.0 HEAT STRESS

201.1 PURPOSE

The purpose of this Operating Procedure is to provide general information on heat stress and the methods that can be utilized to prevent or minimize the occurrence of heat stress.

Adverse climatic conditions are important considerations in planning and conducting site operations. Ambient temperature effects can include physical discomfort, reduced efficiency, personal injury, and increased accident probability. Heat stress is of particular concern while wearing impermeable protective garments, since these garments inhibit evaporative body cooling.

201.2 TYPES OF HEAT STRESS

Heat stress is the combination of environmental and physical work factors that constitute the total heat load imposed on the body. The environmental factors of heat stress are the air temperature, radiant heat exchange, air movement, and water vapor pressure. Physical work contributes to the total heat stress of the job by producing metabolic heat in the body in proportion to the intensity of the work. The amount and type of clothing also affects heat stress.

Heat strain is the series of physiological responses to heat stress. When the strain is excessive for the exposed individual, a feeling of discomfort or distress may result, and, finally, a heat disorder may ensue. The severity of strain will depend not only on the magnitude of the prevailing stress, but also on the age, physical fitness, degree of acclimatization, and dehydration of the worker.

Heat disorder is a general term used to describe one or more of the heat-related disabilities or illnesses shown in Table 201-1.

201.6 MONITORING

201.6.1 Temperature

The environmental heat stress of an area can be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique. When heat stress is a possibility, a heat stress monitoring device, such as the Wibget Heat Stress Monitor (Reuter Stokes) can be utilized.

The WBGT shall be compared to the TLV outlined by the American Conference of Governmental Industrial Hygienists (ACGIH) TLV guides, and a work-rest regiment can be established in accordance with the WBGT. Note that approximately 5°C must be subtracted from the TLVs listed for heat stress to compensate for the wearing of impermeable protective clothing.

201.6.2 Medical

In addition to the provisions of the Woodward-Clyde (W-C) medical surveillance program, on-site medical monitoring of personnel should be performed for projects where heat stress is a significant concern. Blood pressure, pulse, body temperature (oral), and body weight loss may be utilized.

Heart Rate: Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third. If the heart rate still exceeds 110 beats per minute at the next rest cycle, shorten the following work cycle by one-third.

Oral Temperature: Use a clinical thermometer or similar device to measure the oral temperature at the end of the work period (before drinking liquids). If the oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. If the oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following work cycle by one-third.

Do not permit a worker to wear a semipermeable or impermeable garment if his/her oral temperature exceeds 100.6°F (38.1°C).

TABLE 201-1
Classification, Medical Aspects, and Prevention of Heat Illness

Category and Clinical Features	Predisposing Factors	Underlying Physiological Disturbances	Treatment	Prevention
Temperature Regulation Heatstroke **Heatstroke:** (1) Hot, dry skin; usually red, mottled, or cyanotic; (2) rectal temperature 40.5°C (104°F) and over; (3) confusion, loss of consciousness, convulsions, rectal temperature continues to rise; fatal if treatment is delayed	(1) Sustained exertion in heat by unacclimatized workers; (2) lack of physical fitness and obesity; (3) recent alcohol intake; (4) dehydration; (5) individual susceptibility; and (6) chronic cardiovascular disease	Failure of the central drive for sweating (cause unknown) leading to loss of evaporative cooling and an uncontrolled accelerating rise in t_{re}; there may be partial rather then complete failure of sweating	Immediate and rapid cooling by immersion in chilled water with massage or by wrapping in wet sheet with vigorous fanning with cool dry air; avoid overcooling; treat shock if present	Medical screening of workers, selection based on health and physical fitness; acclimatization for 5-7 days by graded work and heat exposure; monitoring workers during sustained work in severe heat
Circulatory Hypostasis Heat Syncope Fainting while standing erect and immobile in heat	Lack of acclimatization	Pooling of blood in dilated vessels of skin and lower parts of body	Remove to cooler area; rest in recumbent position; recovery prompt and complete	Acclimatization; intermittent activity to assist venous return to heat
Water and or Salt Depletion (a) <u>Heat Exhaustion</u> (1) Fatigue, nausea, headache, giddiness; (2) skin clammy and moist; complexion pale, muddy, or hectic flush; (3) may faint on standing with rapid thready pulse and low blood pressure; (4) oral temperature normal or low, but rectal temperature usually elevated (37.5-38.5°C or 99.5-101.3°F); water restriction type: urine volume small, highly concentrated; salt restriction type; urine less concentrated chlorides less than 3 g/L	(1) Sustained exertion in heat; (2) lack of acclimatization; and (3) failure to replace water lost in sweat	(1) Dehydration from deficiency of water; (2) depletion of circulating blood volume; (3) circulatory strain from competing demands for blood flow to skin and to active muscles	Remove to cooler environment; rest in recumbent position; administer fluids by mouth; keep at rest until urine volume indicates that water balances have been restored	Acclimatize workers using a breaking-in schedule for 5-7 days; supplement dietary salt only during acclimatization; ample drinking water to be available at all times and to be taken frequently during work day
(b) <u>Heat Cramps</u> Painful spasms of muscles used during work (arms, legs, or abdominal); onset during or after work hours	(1) Heavy sweating during hot work; (2) drinking large volumes of water without replacing salt loss	Loss of body salt in sweat, water intake dilutes electrolytes; water enters muscles, causing spasm	Salted liquids by mouth or more prompt relief by IV infusion	Adequate salt intake with meals; for unacclimatized workers, supplement salt intake at meals.

C

APPENDIX C
SOP 212

OPERATING PROCEDURE NO. HS-212

212.0 NOISE/HEARING CONSERVATION

212.1 PURPOSE

The purpose of this Operating Procedure (OP) is to establish Woodward-Clyde (W-C) procedures and responsibilities for the administration of a hearing conservation program. A proper hearing conservation program will reduce the risk of occupationally induced hearing loss and provide education and guidance for the prevention of "lifestyle" induced hearing loss.

212.2 HAZARD INFORMATION

Excessive noise exposure can cause both temporary and permanent effects on hearing. The temporary effects of excessive noise include ringing in the ears, interference with communication, and hearing threshold changes. The effect of long-term excessive noise includes varying degrees of noise induced hearing loss.

The damaging effects of noise are dependent on the noise intensity (decibels), the time of exposure, the noise frequency (Hertz), and individual susceptibility. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) and American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) set exposure limits based on exposure per day (in hours) and sound intensity (in decibels A scale or dBA). Exposures above these limits require use of hearing protection (plugs or muffs) to reduce the sound level or the use of noise engineering controls to reduce the sound level.

It is known that noise intensity above 85 dBA for prolonged periods will induce hearing loss. Eighty-five dBA represents a noise level where normal conversation is difficult and individuals will be shouting or talking into the ear of the person to be understood.

noisy area and has no hearing conservation program, W-C will establish a plan for its employees and subcontractors to be in compliance with Section 212.3.

212.6 TRAINING

All workers required to wear hearing protectors will be trained in their proper use. In addition, all workers who may be exposed to greater than 85 dBA will be provided refresher training. This training will include at least the following: (1) Effects of noise on hearing; (2) the purpose, selection, fitting, use and care of hearing protectors; and (3) the purpose of audiometric testing and an explanation of the test procedure.

212.7 HEARING PROTECTORS

When hearing protectors are required the employee must have received training on the proper use. Proper noise reduction ratings will be applied by the HSO/CHSO to the noise in the environment.

Hearing protectors act as barriers to reduce sound entering the ear. Noise Reduction Ratings (NRR) for each product reflects the effectiveness of the protector chosen. Generally, muffs offer a greater NRR (25-30 dBA) than plugs (15-25 dBA). Comfort is an important factor when wearing ear protection over many hours; it is recommended to try different types of plugs or muffs to determine the best combination of comfort and fit.

212.8 AUDIOMETRIC TESTING

Audiograms are administered upon employment and annually/biennially thereafter. The audiograms are conducted by the medical clinics approved for W-C physicals and must meet all the applicable requirements (including Appendices C, D, and E of the OSHA Std. Title 29 Code of Federal Regulations (CFR) 1910.95). The local medical clinic in consultation with Greaney Medical will comply with applicable provisions of Title 29 CFR 1910.95(g) with regard to recordkeeping.

APPENDIX D
SOP 213

OPERATING PROCEDURE NO. HS-213

213.0 TICKS AND TICK-BORNE DISEASES

213.1 PURPOSE

The purpose of this Operating Procedure (OP) is to provide information to Woodward-Clyde (W-C) employees regarding the diseases transmitted by ticks, particularly Lyme disease, and how to reduce employee risk.

213.2 TICK-BORNE DISEASES

Tick-borne diseases represent a significant health risk in many parts of the world. The risk to W-C field staff depends on the work location, the time of year, the clothing worn and other factors. Ticks are documented vectors of virus and bacteria for diseases such as Lyme disease (North America, Europe), Rocky Mountain Spotted Fever (North America), Encephalitis, (Asia, Africa), Boutonneuse Fever (Africa, India, Middle East), and Rickettsiosis (Asia).

While specific information in this OP is limited to Lyme disease, the risk control measures apply to other tick-borne diseases.

213.3 LYME DISEASE

Lyme disease is caused by a coiled bacteria known as a spirochete and is most commonly transferred to humans through ticks. The disease has been found in almost all U.S. states and in Europe, but is most common in locations with a mixture of wooded areas and grasslands. The Lyme disease infection is spread in the wild by tick bites on animals, particularly mice and deer, and infection can include domestic animals such as cats, dogs, and cows. While a number of ticks can transfer Lyme disease, the very small deer tick is the most common.

Field personnel in grassy or wooded areas should wear long pants, long sleeved shirts (tucked in), hat, and consider taping or cinching clothing at the ankles. Work in ares of known high tick concentrations (e.g. wetland areas) should consider use of Tyvek coveralls taped at the ankles and wrists.

Follow label directions carefully for use of tick repellents as many are designed for use on clothing, not on skin. Repellent use should be in combination with proper clothing and is most recommended for the ankles and wrists.

After working in an area of possible tick exposure, it is recommended that the individual shower promptly and check for any ticks. If a tick is found on the skin, remove it promptly using tweezers or forceps, followed by disinfection with alcohol or iodine. It takes several hours for a tick to attach and feed; removing it promptly lessens the chance of being infected.

APPENDIX E
SOP 501

OPERATING PROCEDURE NO. HS-501

501.0 EMPLOYEE MEDICAL SURVEILLANCE

501.1 PURPOSE

Medical surveillance is a major component of the Woodward-Clyde (W-C) health and safety program. It was established to monitor and promote the health of employees engaged in projects which have the potential for exposure to hazardous substances.

501.2 OBJECTIVES

The objectives of the medical surveillance component of the health and safety program are:

- To reduce the health risk for employees assigned to work on hazardous material projects.
- Pre-assignment screening of employee's health to determine present status and to identify existing problems that may be aggravated by chemical exposures or physical stress.
- Monitoring employee health for early signs of work-related illness and employee suitability for further field or laboratory assignments on sites containing potentially hazardous substances.
- Evaluation and care of individuals with work-related illnesses or injuries.
- Satisfy the requirements of Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations (CFR) 1910.134 regarding respiratory protection and OSHA 1910.120 for hazardous waste workers.

- Arrangements to provide special medical examinations, care, and counseling in case of known or suspected exposures to toxic substances. Any special tests performed depend on the chemical substance to which the individual has been exposed.

The site safety plan must address emergency medical care and treatment of personnel, including possible exposures to toxic substances and injuries due to physical hazards. The following items should be considered in emergency care provisions.

- The name, address, and telephone number of the nearest medical treatment facility should be conspicuously posted. A map and/or directions for locating the facility, plus the travel time, should be readily available.

- The facility's ability to provide care and treatment of personnel exposed or suspected of being exposed to toxic (or otherwise hazardous) substances should be ascertained.

- Arrangements should be made to quickly obtain ambulance, emergency, fire, and police services. Telephone numbers and procedures for obtaining these services should be conspicuously posted.

- Emergency showers, eye wash fountains, and first aid equipment should be readily available on-site. The Site Safety Officer (SSO) should have first aid training.

- Provisions should be made for rapid identification of the substance to which the worker has been exposed (if this has not previously been done). This information must be provided to medical personnel.

Under Part 1910.134, OSHA requires medical clearance for those required to wear respirators. Individuals with existing health conditions, such as emphysema, may be excluded from respirator use due to potential health effects.

501.6 EXAMINATION PROTOCOLS

The protocols presented in Table 501-1 apply to baseline, annual, and exit examinations. A detailed health/work history questionnaire is provided before baseline and routine examinations. The protocols may be expanded by the reviewing or examining physician after consultation with W-C.

501.7 EXAMINING PHYSICIAN

Examining physicians will review the information provided by the employee in the questionnaire, examine the employee, and perform laboratory tests. The examining physician will provide the results of the examination to the W-C reviewing physician for final evaluation of employee suitability for work at hazardous material sites. The reviewing physician's conclusions shall supersede those of the examining physician. The examining physician will be contracted directly to Greaney Medical Group.

501.8 REVIEWING PHYSICIAN

Dr. Peter Greaney, Greaney Medical Group of Anaheim, California has been retained to provide medical oversight to the W-C medical surveillance program. The reviewing physician receives copies of all medical questionnaires, examinations, and laboratory testing results, reviews the reports of examining physicians, and determines an employee's fitness for work at hazardous material sites. The reviewing physician also provides advice and assistance regarding site specific medical monitoring needs and programs.

501.8.1 Greaney Medical Group

Greaney Medical Group (GMG) will provide the following services:

- contact the W-C employee for appointment availability
- schedule appointment with appropriate clinic

If a W-C employee does not take a W-C physical examination and the GMG staff has made three attempts to contact the employee over a one month period, GMG will issue a Not Qualified - Health Status Medical Employer Report.

501.10 EMPLOYEE MEDICAL SURVEILLANCE PROGRAM DATABASE

The employee medical surveillance program includes a computerized database which stores and processes employee medical surveillance information such as medical clearance results, training and respirator fit testing data. The purpose of the database is to facilitate record documentation, the reviewing physician's evaluation of the medical surveillance data, and administration of the W-C Health and Safety Program. Administrative and quality control features include: profile reports on employee eligibility for site work, medical examination scheduling reports, training requirement notices, and listing of qualified staff by operating unit and firmwide. The reports are shown as part of Table 501-2.

501.11 CONFIDENTIALITY - MEDICAL RECORDS

Employee medical records are confidential and available for review only by the examining and/or reviewing physicians and their medical personnel. Only the work clearance status and any work limitations are provided to W-C.

Each employee can obtain information on his/her health by asking the examining physician for the information at the time of, or after, an examination. The employee may also request release of records or information, and/or designate a representative, in a letter to the physician. The request must contain the full name and address of the representative and indicate the records to be released. Medical information about an employee will not be made available to anyone without authorization from the individual concerned.

TABLE 501-1
MEDICAL EXAMINATION PROTOCOL
pg 1 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Height and Weight		X	X	X	
Blood Pressure	X		X	X	
Pulse (resting)	X		X	X	
Temperature (oral) Fahrenheit		X	X	X	
Vision Snellen (R&L)			X	X	
Vision Titmus (R&L)	X				
Near-corrected & Uncorrected					
Far-corrected & Uncorrected					
Peripheral (Visual Field)					
Color					
Audiogram		X	X	X	
Pulmonary Function Test		X	X	X	
CBC Count (Hemogram)		X	X	X	
WBC					
RBC					
HGB					
HCT					
MCV					
MCH					
MCHC					

TABLE 501-1
MEDICAL EXAMINATION PROTOCOL
page 3 of 4

Test	Testing Frequency			Remarks
	Baseline	Annual	Exit	
Cardiogram	X	*See Remarks	*Note	Every 3 years for less than or equal to 40 years old. Every year for more than 40 years old. *NOTE: For Exit exam, EKG performed only if not performed in past year.
Treadmill	*See Remarks	*See Remarks		Only if: *Abnormal EKG (except sinus bradycardia, unless an otherwise healthy person) or *History of angina or *History of myocardial infarction (MI) or *History of cardiac surgery.

TABLE 501-5
NIDA 5 DRUG TESTING THRESHOLD LEVELS

	Screening Limit	Confirming Limit
Cocaine	300 ng/mls	150 ng/mls
Marijuana Cannabinoids	100 ng/mls	15 ng/mls
Opiates	300 ng/mls	300 ng/mls
Phencyclidine (PCP)	25 ng/mls	25 ng/mls
Amphetamines	1000 ng/mls	500 ng/mls

Source for NIDA 5 Levels - SmithKline Bio-Science Laboratories; "Substance of Abuse-Testing in the Workplace".

NOTES:

1. Clients that require drug testing will list drugs and threshold levels in their contract. If the contract states NIDA 5 testing, then the above list can be used.

   When the threshold level for marijuana is lower than the above referenced levels, then the client is probably testing for passive use.

2. DOT testing requires the NIDA 5.

3. Drug testing is not part of the standard W-C Medical Surveillance Program. Drug testing is performed due to client or DOT requirements or for cause.

APPENDIX F
SOP 102

OPERATING PROCEDURE NO. HS-102

102.0 INCIDENT REPORTS

102.1 PURPOSE

All health and safety incidents shall be reported to Woodward-Clyde (W-C) management and health and safety staff. The prompt investigation and reporting of incidents will reduce the risk of future incidents, better protect W-C employees, and reduce W-C liability.

102.2 DEFINITIONS

A health and safety incident is any event listed below:

- Illness resulting from chemical exposure or suspected chemical exposure.
- Physical injury, including both those that do and do not require medical attention to W-C employees or W-C subcontractors.
- Fire, explosions, and flashes resulting from activities performed by W-C and its subcontractors.
- Property damage resulting from activities performed by W-C and its subcontractors.
- Vehicular accidents occurring on-site, while travelling to and from client locations, or with any company-owned vehicle.
- Infractions of safety rules and requirements.
- Unexpected chemical exposures.
- Complaints from the public regarding W-C field operations.

102.3 REPORTING PROCEDURES

102.3.1 Reporting Format

FORM HS-102

W-C HEALTH AND SAFETY INCIDENT REPORT

Project Name: _____

Project Number: _____

Date of Incident: _____

Time of Incident: _____

Location: _____

_____

TYPE OF INCIDENT (Check all applicable items)

- ☐ Illness
- ☐ Injury
- ☐ Property Damage
- ☐ Fire, explosion, flash
- ☐ Unexpected exposure
- ☐ Vehicular Accident
- ☐ Health & Safety Infraction
- ☐ Other (describe) _____

DESCRIPTION OF INCIDENT (Describe what happened and possible cause. Identify individual involved, witnesses, and their affiliations; and describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.)

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Reporter: _____ _____ _____

Print Name | Signature | Date

Reporter must deliver this report to the Operating Unit Health & Safety Officer within 24 hours of the reported incident for medical treatment cases and within five days for other incidents.

Reviewed by: _____ _____

Operating Unit Health & Safety Officer | Date

Distribution by HSO:

- WCGI Corporate Health and Safety Manager
- Corporate Health and Safety Officer
- Project Manager
- Personnel Office (medical treatment cases only)

APPENDIX G
SOP 301,302,303

OPERATING PROCEDURE NO. HS-301

301.0 SELECTION AND USE OF RESPIRATORY PROTECTION EQUIPMENT

301.1 PURPOSE

The purpose of this Operating Procedure (OP) is to provide information for the proper selection of respiratory protection equipment. It is to insure that respirators are properly selected and used in accordance with Occupational Health and Safety Administration (OSHA) requirements. Respirators must be selected on the basis of the hazards to which personnel are or may potentially be exposed.

301.2 REQUIREMENTS

The OSHA standards found in Title 29 of the Code of Federal Regulations, Section 1910.134 establishes requirements for respiratory protection programs, which is summarized in the following eleven major points:

1. Establish Written Operating Procedures - A formal written document outlining aspects of the respiratory protection program must be developed.

2. Respirator Selection - Proper selection of respirators shall be made according to the guidance of American National Standards Institute (ANSI) Z88.2-1980. In choosing respirators, consider the nature and extent of the hazard, the work requirements and conditions, and the characteristics and limitations of the respirators available. When examining the hazardous environment, some of the questions that should be asked are:

   - What are the contaminants?
   - What are their concentrations?
   - Are they gaseous or particulate?
   - Do they have adequate warning properties?
   - Are concentrations immediately dangerous to life or health?
   - Does the air contain at least 19.5 percent oxygen?

it is not enforced. Frequent random inspections shall be conducted by a qualified individual to assure that respirators are properly selected, used, cleaned, and maintained. If defects are found, corrective action should be taken.

10. Medical Evaluation of Respirator Wearers - If a potential respirator wearer is not physically able to perform the work using a respirator, the use of a respirator may create more problems than it solves. A physician should be consulted to make sure each respirator wearer is physically qualified.

11. Use Approved or Accepted Respirators - The respirators you use in your work environment must be National Institute of Occupational Safety and Health (NIOSH)/Mine Safety and Health Administration (MSHA) certified, where applicable, or be otherwise accepted to provide adequate protection for the hazards encountered.

301.3 SELECTION

A summary diagram of the respirator selection process is presented in Figure 301-1. It provides an overview of the decision logic that should be used during selection of respiratory protection equipment. A listing of specific decision considerations is presented below.

1. What is the estimated contaminant concentration where the respirator will be used, as determined by industrial hygiene monitoring information.

2. What is the Permissible Exposure Limit (PEL) to the contaminant, Threshold Limit Value (TLV), and Short-Term Exposure Limit (STEL)?

   Health standards for many specific substances are available. OSHA Standard 1910.1000, Tables Z1, Z2, and Z3 gives the required PEL's when no health standards supersede these tables. However, since these tables are established from the 1969 TLV list, good industrial hygiene practice would base respirator selection on current TLV's, if lower, or other new toxicity data.

8. If the contaminant is a gas or vapor, is there any available sorbent that traps it efficiently?

   Respirator manufacturers and/or industrial hygienists can provide this information.

9. Can the contaminant be absorbed through the skin as a vapor or liquid? If so, will it significantly add to the employee's exposure and cause injury?

   Skin absorption is indicated in the OSHA Standard 1910.1000, Table Z1 by the notation "skin" after the material name. Material Safety Data Sheets will also indicate skin absorption potential.

10. What is the size of the employee's face?

    Some manufacturers offer the same model respirator in two or three sizes. This will help to fit most employees properly with one brand of respirator.

11. What types of respirators will give the required Maximum Use Concentration (MUC)?

    The MUC is a measure of the degree of protection provided by a respirator to a wearer. It takes into account the respirator limitations and the ability of a user to get a satisfactory fit. Multiplying the PEL (or STEL) by the protection factor assigned to a respirator gives the MUC of the hazardous material for which the respirator can be used.

$$\text{MUC} = \text{PEL} \times \text{Protection Factor}$$

A table of MUCs of various respirators for different contaminants is presented in Table 301-1.

301.4 AIR-PURIFYING RESPIRATORS (APR)

- Fit the respirator as outlined in OP HS-302, Respirator Fit Testing.

- The cartridges may be used until the odor of the contaminant can be smelled, irritation occurs or the substance can be tasted by the wearer.

- Do not use cartridges after expiration date printed on the label.

- If the facepiece and cartridges are used by one employee and the cartridges are not used until exhaustion, they may be resealed after use, by the employee, and reused at a future time. This may be done until cartridge exhaustion.

- Inspect, clean and maintain respirators as outlined in OP HS-303, Respirator Inspection, Care, Maintenance and Storage.

- Most respirator manufacturers now supply a given model respirator in different sizes so that many employees can be fitted with a single brand of respirator.

301.5 SUPPLIED AIR RESPIRATORS

301.5.1 Self-Contained Breathing Apparatus (SCBA)

The self-contained breathing apparatus affords complete respiratory protection in any atmosphere for which the lungs are the principal route of entry into the body. They supply the wearer with cool, non-contaminated breathing air, as demanded by the wearer, at approximately ambient atmospheric pressure. For specific instructions on SCBA units, consult the SCBA manufacturer's manual.

4. Disconnect breathing tube from regulator and place bottom of tube tightly on palm. Inhale to check seal. Reconnect breathing tube.

5. Take off breathing apparatus and close cylinder valve.

6. Observe both gauges to see if they correspond, and check for air leaks in system.

7. Crack emergency bypass or release air from facepiece and slowly reduce air pressure on regulator gauge to determine that the audible alarm activates at the proper pressure.

8. Check:

- Condition of straps on harness.
- Tightness of screws and fasteners on:
  - straps
  - regulator bracket
  - all valve handles.
- Locking devices on:
  - main line valve
  - cylinder valve
  - carrier to secure cylinder.
- Holes in diaphragm cap on regulator to see if open.
- Facepiece:
  - should be clean
  - head band in good condition
  - exhalation valve not sticking or held open
  - inhalation valve not sticking or held open
  - speaking diaphragm and gasket in correctly.

9. Gaskets should be in good condition at:

- Regulator side of breathing tube.

must be located away and upwind from sources of contamination such as engine exhaust and that the compressor is designed for breathing air supply.

The airflow requirements vary with the manufacturer, but generally include a pressure gauge and regulator at the cylinders, with connecting hose pressures less than 125 psi, and a second regulator at the worker, with the pressure dropped further for entry into the facepiece. The maximum length of connecting hose is 300 ft.

The use of air-line respirators requires proper securing of breathing air cylinders, regular observation of tank pressures to ensure an uninterrupted flow to workers, protection of the connecting hoses, specialized training of employees, and inspection of the equipment according to the specific manufacturers directions.

301.6 WARNINGS RELATED TO RESPIRATOR SELECTION AND USE

1. Failure to properly select the appropriate respirator for all the materials and concentrations to which the respirator wearer may be exposed may result in serious illness, disability, or death of the affected worker.

2. Only self-contained positive pressure breathing apparatus and pressure demand air-line respirators with auxiliary tanks are designed for use in:

   - Oxygen deficient atmospheres (an atmosphere of less than 19.5 percent oxygen by volume at sea level).

   - Poorly ventilated areas, or confined spaces such as tanks, small rooms, tunnels or vessels, unless the confined space is well ventilated and the concentration of toxic contaminants is known to be below the upper limit recommended for the respirator.

   - Atmospheres where the concentrations of toxic contaminants are unknown or are IDLH.

8. Air-purifying respirators should not be used for sandblasting or for gas or vapor contaminants with poor warning properties.
9. Any air-purifying respirator, when properly selected and fitted, will significantly reduce, but will not completely eliminate, the breathing of contaminant(s) by the respirator wearer. The wearer, when working in atmospheres containing substances such as asbestos (that are reputed to cause cancer in amounts below their TLV) will obtain better protection from a continuous flow or positive pressure air supplied respirator.

301.7 SPECIAL RESPIRATOR-USE PROBLEMS

301.7.1 Facial Hair

Facial hair lying between the sealing surface of a respirator face piece and the wearer's skin will prevent a good seal. Except with positive pressure air-line respirators, powered air-purifying respirators, and pressure-demand SCBA, a negative pressure exists within the mask upon inhalation; a poor seal will permit contaminated air to enter the facepiece. Even a few days' growth of beard can permit contaminant penetration.

Respirators should not be worn when conditions prevent a good seal of the facepiece to the face. **Facial hair in the form of beards, mustaches, sideburns, and stubble should not be permitted on employees required to wear respirators, if the hair comes between the facepiece sealing surface and the face.**

301.7.2 Corrective Lenses

Employees wearing corrective eye glasses present a special problem with respect to respiratory protection. Spectacle temple bars, or straps that pass between the sealing surface of a full facepiece respirator and the wearer's face, prevent a good seal and thus must not be worn.

Spectacles with short temple bars that do not interfere with respirator sealing and are taped to the employee's face may be used temporarily. Special corrective lenses or spectacle inserts that can be permanently mounted inside a full facepiece respirator are available from most manufacturers. Such corrective lenses should be mounted in the facepiece such that it ensures good vision and comfort.

can be supplied by a user mounted, battery powered backpack purifier, or by a stationary pump through up to 25 feet of low pressure hose. It has good applicability to abrasive blasting, grinding, pesticide spraying and operations using asbestos.

Generally, powered air-purifying units can be used up to 25 times the PEL for dusts, mists, and fumes, when used with filters that are approved for materials with PELs not less than 0.05 mg/m^3 or 2 mppcf and nuisance dusts. Such respirators can be used up to 25 times the PEL when used with high efficiency filters. For use in chemical vapor or gaseous atmospheres, the MUC depends on the chemical cartridge or canister used. In all cases check the manufacturer's specifications and the NIOSH/MSHA approval for the particular configuration used. Consideration should first be given to standard air-purifying units, supplied air devices and SCBAs.

301.9 DISPOSABLE RESPIRATORY PROTECTION EQUIPMENT

The use of disposable respiratory protection devices eliminates the need to clean, disinfect, inspect and repair equipment. Since the cleaning and maintenance aspects of a respiratory protection program can require time and dollar expenditures, the use of equipment not requiring such services may be desirable in some instances. While the cost of disposable equipment may, in some cases, be higher than comparable reusable devises, this cost may be offset or recoverable by the savings of labor and capital investments for cleaning and inspection facilities.

Disposable chemical vapor or gas respirators might be used economically where limited numbers of this type of respirator are in use or where specific operations are performed infrequently.

TABLE 301-1

NIOSH RECOMMENDED MAXIMUM USE CONCENTRATIONS
(EXPRESSED IN PPM)
FOR GAS AND VAPOR AIR-PURIFYING ELEMENTS

	Classification of gas and vapor air-purifying elements		
Type of gas or vapor	Cartridge(s)	Chin-style canister	Front- or back-mounted canister
Organic vapors	1,000*	5,000†	20,000†
Acid gases			
Sulfur dioxide (SO_2)	50	100	100
Chlorine (Cl_2)	10	25	25
Hydrochloric (HCl)	50	100	100
Ammonia (NH_3)	300	500	500
Methyl amine (CH_3NH_2)	100	--	--
Carbon monoxide (CO)	NA	NA	1,500

* Maximum use concentration will be 1,000 ppm or the immediately dangerous to life or health (IDLH) value for the specific organic vapor, whichever is lower.

† Maximum use concentration for "entry into" will be limited to the value listed or to the IDLH value for the specific organic vapor, whichever is lower.

302.0 RESPIRATOR FIT TESTING

302.1 PURPOSE

The purpose of this Operating Procedure is to identify and to establish respirator fit testing requirements and procedures.

302.2 REQUIREMENTS

In compliance with Occupational Safety and Health Administration (OSHA) regulation Title 29 Code of Federal Regulations (CFR) 1910.134, all Woodward-Clyde (W-C) employees whose job assignments require use of non-powered air-purifying respirators (APR) or air-supplied respirators (ASR) that operate in the demand mode, must be fit tested using the isoamyl acetate (IAA) and/or the irritant smoke (IS) test. Fit tests shall be performed to identify the brand and size of respirator that fits each employee and to facilitate final fitting adjustments in the field.

Fit tests must be recorded for each tested employee. The record shall include test dates and identify the brands, models, and sizes of respirators tested.

302.3 ISOAMYL ACETATE TEST

302.3.1 Isoamyl Acetate Test Equipment

- Isoamyl acetate (USP grade in bottles or in ampules).
- Two bottles for odor recognition testing.
- Test enclosure. A simple test enclosure can be constructed by cutting a small slit at the center of the closed end of a clear plastic bag and inserting the hook of a wire clothes hanger through the slit so that the bag will hang open side down. The bag should be at least 3 mil thick and approximately the size of a garbage bag (large size).

2. The wearer stands with his/her back towards a fume hood or other ventilation source and is asked to keep his/her eyes closed during the test. (Note: eyes must be closed even when full-face respirators are tested.)

3. With the wearer holding his/her head still, the tester lightly puffs smoke over the facepiece, holding the tube at least 2 feet from it. The volume of smoke should be kept minimal and the wearer's reaction observed between puffs.

4. If the wearer detects no leakage, the tester increases smoke density and moves the tube progressively closer to the wearer, but no closer than 6 inches. If no leakage is detected, exposure is continued while the wearer performs the activities listed in Section 302.5.

5. If no leakage is detected with and without head movements, a satisfactory fit can be assumed. However, if leakage is detected, smoke generation should be stopped and Steps 3 and 4 repeated after the wearer readjusts the facepiece and/or head straps.

6. If a respirator under test continues to leak, another respirator of the same brand, model, and size should be tried. If it does not pass the test, another size or another brand should be tried.

302.5 ACTIVITIES

If, during the IAA or IS test, no leakage occurs while the wearer is holding his/her head still, the test shall be continued while the wearer is instructed to perform the following activities:

1. Deep breathing as in heavy exertion. This activity should not be done long enough to cause hyperventilation.

2. Side-to-side, then up-and-down head movements (exaggerated).
3. Read the "Rainbow Passage." Must be loud enough to be heard by someone standing nearby.

HS-302

WOODWARD-CLYDE

HEALTH AND SAFETY TRAINING

RESPIRATOR FIT TEST RECORD

Name: _____ Social Security No: _____

Company/Office: _____ Last Medical Exam: _____

Fit Test Date: _____ Corrective Lenses Needed: Yes ☐ No ☐

Briefed on fundamental principles of respiratory protection, use, selection, inspection cleaning, maintenance and storage of equipment. Yes ☐ No ☐

Isoamyl acetate odor recognition Yes ☐ No ☐

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Equipment Type			
Manufacturer's Name			
Model			
Size			
Facepiece Composition (Rubber Silicone)			

TEST PERFORMED	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Negative Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Positive Pressure Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Isoamyl Acetate Vapor Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐
Irritant Smoke Test:	P ☐ F ☐	P ☐ F ☐	P ☐ F ☐

The individual named above has been fit-tested according to procedures specified in Woodward-Clyde's Operating Procedure HS-302. This qualitative fit test protocol has been adapted from OSHA 29 CFR 1910 and 29 CFR 1926.

Examiner's Name (Please Print)	Examiner's Signature	Date

Employee's Signature	Date

303.0 RESPIRATOR INSPECTION, CARE, MAINTENANCE, AND STORAGE

303.1 PURPOSE

The purpose of this Operating Procedure (OP) is to provide guidance on the proper care and use of respiratory protective devices, and to assist in adequately protecting personnel as well as complying with Occupational Safety and Health Administration (OSHA) respiratory protection standard Title 29 Code of Federal Regulations (CFR) 1910.134. Guidance in the selection of respiratory devices is provided in OP HS-301.

303.2 APPLICABILITY

This procedure is applicable for use in caring for half-face and full-face respirators of either air-purifying or air-supplying type. Proper care of respirators is essential for their satisfactory performance. Of importance is respirator inspection, care, maintenance, and storage.

303.3 REQUIREMENTS

OSHA requires, as part of an inspection program, that all respirators be leak checked, a determination that the complete assembly is gas tight. Follow field inspection procedures to examine the freshly cleaned, reassembled respirator.

"Cleaning and Disinfecting" - OSHA 1910.134 states "routinely used respirators shall be collected, cleaned and disinfected as frequently as necessary to ensure that proper protection is provided..." and that emergency use respirators "shall be cleaned and disinfected after each use."

The OSHA standard states that "replacement or repair shall be done by experienced persons with parts designed for the respirators." Besides being contrary to OSHA requirements, **substitution of parts from a different brand or type of respirator invalidates approval (i.e.,**

- Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s), if required.

2. Examine the head straps or head harness for:

   - Breaks;
   - Loss of elasticity;
   - Broken or malfunctioning buckles and attachments; and
   - Excessively worn serrations on head harness, that might permit slippage (full facepieces only).

3. Examine the exhalation valve for the following after removing its cover:

   - Foreign material, such as detergent residue, dust particles or human hair under the valve seat;
   - Cracks, tears or distortion in the valve material;
   - Improper insertion of the valve body in the facepiece;
   - Cracks, breaks, or chips in the valve body, particularly in the sealing surface;
   - Missing or defective valve cover; and
   - Improper installation of the valve in the valve body.

4. Examine the air-purifying element for:

   - Incorrect cartridge, canister or filter for the hazard;
   - Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder;
   - Expired shelf-life date on the cartridge or canister; and
   - Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc., over the inlet.

5. If the device has a corrugated breathing tube, examine it for:

   - Broken or missing end connectors;

3. Examine the air-supply systems for:

   - Integrity and good condition of air-supply lines and hoses, including attachment and end fittings; and

   - Correct operation and condition of all regulators, or other air flow regulators.

In addition to the above, for self-contained breathing apparatus (SCBA) units also determine that:

1. The high pressure cylinder of compressed air is sufficiently charged for the intended use, preferably fully charged.

2. On closed-circuit SCBA, a fresh canister of CO_2 (carbon dioxide) sorbent is installed.

3. On open-circuit SCBA, the cylinder has been recharged if less than 25 percent of the useful service time remains.

All SCBAs are required to have a warning device that indicates when the 25 percent level is reached. However, it is recommended that an open-circuit SCBA be fully charged before use.

The specific inspecting procedures for the brand of air-line or SCBA equipment should be followed.

303.4.3 Respirator Disassembly

The used respirators should be collected and deposited in a central location. They are taken to an area where the filters, cartridges or canisters are removed and discarded. Canisters should be damaged or marked to prevent accidental reuse. If facepieces are equipped with reusable dust filters, they may be cleaned with compressed air in a hood. This prevents dust from getting into the room and affecting the respirator personnel. If

When a relatively small number of respirators are used, or where workers clean their own respirators, the generally accepted procedure is washing with detergent and warm water using a brush, thoroughly rinsing in clean water, and drying in a clean place. Precautions should be taken to prevent damage from rough handling during this procedure.
When large numbers of respirators are used, it is recommended that centralized cleaning and maintenance be performed and that specialized equipment and personnel trained in respirator maintenance be utilized.

303.5.1 Cleaning and Sanitizing

The actual cleaning may be done in a variety of ways. A commercial dishwasher can be used. A standard domestic clothes washer may also be used if a rack is installed around the agitator to hold the facepieces in fixed positions. If the facepieces are placed loosely in the washer, the agitator may damage them. A standard domestic dishwasher may be used, but it is not preferred because it does not immerse the facepieces. Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Disinfection is not absolutely necessary if the respirator is reused by the same person. However, where individual issue is not practical, disinfection is strongly recommended. Reliable, effective disinfectants may be made from readily available household solutions, including:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Chlorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.

2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

If the respirators are washed by hand, a separate disinfecting rinse may be provided. If a washing machine or dishwasher is used, the disinfectant must be added to the rinse cycle;

303.6 MAINTENANCE AND REPAIR

Maintenance personnel must be thoroughly trained. They must be aware of the limitations and never try to replace components or make repairs and adjustments beyond the manufacturer's recommendations, unless they have been specially trained by the manufacturer.

These restrictions apply primarily to maintenance of the more complicated devices, especially closed- and open-circuit SCBAs, and more specifically, regulator valves and low pressures warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. There should be no major problems in repairing and maintaining most respirators, particularly the commonly used air-purifying type.

An important aspect of any maintenance program is having enough spare parts on hand. Only continual surveillance of replacement rates will determine what parts and quantities should be kept in stock. It is desirable to have a recording system to indicate spare parts usage and the inventory on hand.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

303.7 RESPIRATOR STORAGE

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt. Freshly cleaned respirators should be placed in heat-sealed, ziplock, or other reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set."

Air-purifying respirators kept ready for non-routine or emergency used should be stored in a cabinet with individual compartments. The storage cabinet should be readily accessible, and all workers should be made aware of its location, as is done for fire extinguishers.

Birkner, L.R., Respiratory Protection A Manual and Guideline, American Industrial Hygiene Association, 1991.

APPENDIX H
SOP 503

OPERATING PROCEDURE NO. HS-503

503.0 EMERGENCY PROCEDURES

503.1 PURPOSE

The purpose of this Operating Procedure is to provide guidance in preparing for contingency or emergency situations during field activities. Accidents can and do happen. However, with adequate planning and preparedness resulting consequence can be minimized or prevented.

Emergency preparedness starts with advanced planning. It requires anticipation of potential problems or hazards. Proper emergency preparedness involves use of the project health and safety plan that may address emergency situations. It involves training, site orientation of personnel, medical information of personnel, and availability of emergency equipment and services.

503.2 TYPES OF EMERGENCIES

There are three major categories of emergencies that can occur during hazardous waste site investigations. They are medical emergencies, accidents, and safety equipment problems.

503.2.1 Medical Emergencies

Medical emergencies can be described as situations that present a significant threat to the health of personnel involved in site investigations. These can result from chemical exposures, heat stress, cold stress, and poisonous insect or snake bites. Medical emergencies must be dealt with immediately and proper care should be administered. This may be in the form of first aid and emergency hospitalization.

503.2.2 Accidents

Advance planning should be practiced and include assessments of potential hazards or problems that may be encountered. Emergency preparedness should be addressed in the site safety plan. It should consider:

- Hazard evaluation;
- Emergency precautions;
- Hospital/poison control centers (telephone numbers);
- Emergency transportation systems (fire, police, ambulance);
- Emergency routes (maps, dry runs); and
- Escape routes:
  - On-site escape (rapid evacuation to safe area)
  - Off-site escape (best means of evacuation from site).

503.4 TRAINING

Investigative teams should include personnel with training in first aid and CPR. Personnel should become familiar with site area, available equipment, and emergency services available.

503.5 MEDICAL SURVEILLANCE INFORMATION

Personnel should be aware of any special medical problems of individual team members. This may include allergies, insect stings, poison plants, penicillin, etc.

503.6 EMERGENCY EQUIPMENT

Provisions should be made to have appropriate emergency equipment available and in proper working condition. This equipment may include:

- First aid kits;
- Eye wash kits - fill and pressurize;
- Fire extinguisher;
- Emergency oxygen;

503.8 DOCUMENTATION

Records should be maintained with regard to emergency situations. Incident/Accident Reports should be filed in the event of an incident or accident (see OP HS-102).

APPENDIX I
SOP 211

OPERATING PROCEDURE NO. HS-211

211.0 BLOODBORNE PATHOGENS

211.1 BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

The following Exposure Control Plan has been developed in accordance with the Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens Standard, Title 29 Code of Federal Regulations (CFR) 1910.1030. The goal is to reduce the risk of disease in employees potentially exposed to bloodborne pathogens.

211.2 EXPOSURE ROUTES

The transmission of infectious agents such as bacteria and virus's may occur through direct contact, airborne, and vector routes of exposure. Direct contact is an important route of exposure for bloodborne pathogens due to needlestick injuries, puncture injuries, contact with abraded skin, or contact with areas such as the eyes, without skin protection. While very few organisms can enter the body through normal intact skin, direct contact with blood is to be avoided.

The airborne route of exposure is significant for common viral diseases including colds, flu, mumps, and chicken pox, but is not typically an exposure route for pathogens such as Human Immodeficiency Virus (HIV) or Hepatitis B Virus (HBV) infections.

Vector borne diseases are those transferred to humans by insects or animals and include lyme disease, malaria, plague, and rabies. (Further information on tick-borne diseases may be seen in HS-213.) Vectors are not considered a significant route of exposure for HIV or HBV.

Woodward-Clyde (W-C) employees that may have potential exposure to blood or to biohazard waste include Site Safety Officers (SSO) during first aid procedures and field staff on projects involving medical or other infectious waste. The W-C job classification and associated tasks for these categories are as follows:

- Handwashing after administering first aid
- Removal of blood contaminated clothing
- Clean-up of blood on tools or equipment

The controls will be checked and maintained on a regular schedule. The schedule for reviewing the effectiveness of the controls is as follows:

- Controls and procedures will be checked daily before start of any field activities.
- Maintaining and enforcing these controls will be the responsibility of the Site Health and Safety Officer.

Handwashing facilities must be readily accessible after incurring exposure. If handwashing facilities are not feasible, the SSO is required to provide either an antiseptic cleanser in conjunction with a clean cloth/paper towels or antiseptic towelettes. If these alternatives are used, then the hands are to be washed with soap and running water as soon as feasible.

If employees incur exposure to their skin or mucous membranes then those areas shall be washed or flushed with water, as appropriate, as soon as feasible following contact.

211.5 CONTAINERS

Contaminated cutting materials, (i.e., knife, scissors) that are re-usable are to be placed immediately, or as soon as possible after use, into a separate container. These containers must be puncture resistant, labeled with a biohazard label, and be leakproof.

Containers for biohazard waste (used bandages, used gloves, etc.) will be located in the same area as the first aid equipment, and will be the responsibility of the SSO for proper disposal. Disposal will be

211.9 PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment will be chosen based on the anticipated exposure to blood or other potentially infectious materials. The protective equipment will be considered appropriate only if it does not permit blood or other potentially infectious materials to pass through or reach the employees' clothing, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used. This PPE will be stored or placed with all first aid equipment or kits.

All personal protective equipment will be cleaned, laundered, and disposed of by the employer at no cost to employees.

Any clothing which is penetrated by blood shall be removed immediately or as soon as feasible. PPE will be removed prior to leaving the work area.

Gloves shall be worn where it is reasonably anticipated that employees will have had contact with blood or other potentially infectious materials. Gloves will be available from the first aid kit.

Disposable gloves used during first aid and/or emergency procedures are not to be washed or decontaminated for re-use and are to be replaced as soon as practical when they become contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised. Utility gloves may be decontaminated for re-use provided that the integrity of the glove is not compromised. Utility gloves will be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.

Respirators in combination with eye protection devices, such as goggles or glasses with solid side shield, or chin length face shields, are required to be worn whenever splashes, spray, splatter, or droplets of blood or other potentially infectious materials may be generated.

Tyvek coverall (coated or uncoated), should be worn if the potential exists for blood to splash onto the first aid responders clothing.

All employees who incur an exposure incident will be offered post-exposure evaluation and follow-up.

This follow-up will include the following:

- Documentation of the route of exposure and the circumstances related to the incident.

- If possible, the identification of the source individual and, if possible, the status of the source individual. The blood of the source individual will be tested (after consent is obtained) for HIV/HBV infectivity.

- Results of testing of the source individual will be made available to the exposed employee with the exposed employee informed about the applicable laws and regulations concerning disclosure of the identity and infectivity of the source individual.

- The employee will be offered the option of having their blood collected for testing of the employee's HIV/HBV serological status. The blood sample will be preserved for up to 90 days to allow the employee to decide if the blood should be tested for HIV serological status. However, if the employee decides prior to that time that testing will or will not be conducted then the appropriate action can be taken and the blood sample discarded.

- The employee will be offered post-exposure prophylaxis in accordance with the current recommendations of the U.S. Public Health Service.

- The employee will be given appropriate counseling concerning precautions to take during the period after the exposure incident. The employee will also be given information on what potential illnesses to be alert for and to report any related experiences to appropriate personnel.

- The HSO has been designated to assure that the policy outlined here is effectively carried out as well as to maintain records related to this policy.

5) Procedures which might cause exposure to blood or other potentially infectious materials while performing first aid.
6) Control methods which will be used at the facility to control exposure to blood or other potentially infectious materials
7) Personal protective equipment available on-sites
8) Post-exposure evaluation and follow-up
9) Signs and labels used on-site
10) Hepatitis B vaccine program for W-C

The HSO is responsible for providing the training for their office.

211.15 RECORDKEEPING

All records required by the OSHA standard will be maintained by the HSO.

All employees will receive refresher training every 12 months. (Note that this training is to be conducted within one year of the employee's previous training.)

The outline for the training material is located in each office and also with the WCGI Health and Safety Office in Philadelphia, Pennsylvania.